

CasChem

CONTAINS NO CBI



000611786T

CasChem, Inc.
40 Avenue A
Bayonne, NJ 07002
[201] 858-7900
Fax # [201] 437-2728

90-890000 655

September 22, 1989

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Document Processing Center
Office of Toxic Substances, TS-790
U.S. EPA
401 M Street, SW
Washington, DC 20460

Attention: CAIR Reporting Office

RE: COMPREHENSIVE ASSESSMENT INFORMATION RULE REPORTING FORM

Gentlemen:

Enclosed is the completed and signed Reporting Form for this facility. Those pages not included do not apply for the substance at our site, TDI.

Very truly yours,

A handwritten signature in dark ink, appearing to read 'Stuart B. Cooper', with a long horizontal flourish extending to the right.

Stuart B. Cooper
Manager of Regulatory Affairs

SBC/cmm
encl.

cc: Albert Eilender

CERTIFIED, RETURN RECEIPT NUMBER: P068762347



Form Approved
OMB No. 2010-0019
Approval Expires 12-31-89

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Comprehensive Assessment Information Rule
REPORTING FORM

When completed, send this form to:

Document Processing Center
Office of Toxic Substances, TS-790
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460
Attention: CAIR Reporting Office

For Agency Use Only:

Date of Receipt: _____

Document
Control Number: _____

Docket Number: _____

SECTION 1 GENERAL MANUFACTURER, IMPORTER, AND PROCESSOR INFORMATION

PART A GENERAL REPORTING INFORMATION

1.01 This Comprehensive Assessment Information Rule (CAIR) Reporting Form has been completed in response to the Federal Register Notice of..... [1][2] [2][2] [8][8]
CBI mo. day year

☐ a. If a Chemical Abstracts Service Number (CAS No.) is provided in the Federal Register, list the CAS No. [] [2] [6] [4] [7] [1] - [6] [2] - [5]

b. If a chemical substance CAS No. is not provided in the Federal Register, list either (i) the chemical name, (ii) the mixture name, or (iii) the trade name of the chemical substance as provided in the Federal Register.

(i) Chemical name as listed in the rule _____

(ii) Name of mixture as listed in the rule _____

(iii) Trade name as listed in the rule _____

c. If a chemical category is provided in the Federal Register, report the name of the category as listed in the rule, the chemical substance CAS No. you are reporting on which falls under the listed category, and the chemical name of the substance you are reporting on which falls under the listed category.

Name of category as listed in the rule _____

CAS No. of chemical substance [] [] [] [] [] [] - [] [] - []

Name of chemical substance _____

1.02 Identify your reporting status under CAIR by circling the appropriate response(s).

CBI Manufacturer 1

☐ Importer 2

Processor ③

X/P manufacturer reporting for customer who is a processor 4

X/P processor reporting for customer who is a processor 5

☐ Mark (X) this box if you attach a continuation sheet.

1.03 Does the substance you are reporting on have an "x/p" designation associated with it in the above-listed Federal Register Notice?

CBI

☐ Yes ☒ Go to question 1.04
☐ No ☐ Go to question 1.05

1.04 a. Do you manufacture, import, or process the listed substance and distribute it under a trade name(s) different than that listed in the Federal Register Notice? Circle the appropriate response.

CBI

☐ Yes (1)
☐ No 2

b. Check the appropriate box below:

☒ You have chosen to notify your customers of their reporting obligations

Provide the trade name(s) See Continuation Sheet

☐ You have chosen to report for your customers

☐ You have submitted the trade name(s) to EPA one day after the effective date of the rule in the Federal Register Notice under which you are reporting.

1.05 If you buy a trade name product and are reporting because you were notified of your reporting requirements by your trade name supplier, provide that trade name.

CBI

☐ Trade name Mondur TD-80; Lupranate T-80 Type 2 Voranate T-80

Is the trade name product a mixture? Circle the appropriate response.

Yes 1

No (2)

1.06 Certification -- The person who is responsible for the completion of this form must sign the certification statement below:

CBI

☐ "I hereby certify that, to the best of my knowledge and belief, all information entered on this form is complete and accurate."

Stuart Cooper
NAME

[Signature]
SIGNATURE

9/22/89
DATE SIGNED

Regulatory Affairs Manager
TITLE

(201) 858 - 7900
TELEPHONE NO.

☒ Mark (X) this box if you attach a continuation sheet.

CASCHEM, INC.

CAIR REPORT

104.b Continuation Sheet

Trade Names of CasChem Products with Residual TDI:

<u>TRADE NAME</u>	<u>PRODUCT CODE</u>
DYNAFLEX 202-3C	72302
DYNAFLEX 443	72305
DYNAFLEX 513	72306
DYNAFLEX 403	72304
DYNAFLEX 760	72308
EV 68-28	90149
VORITE 128	72027
VORITE 128 M2	72040
VORITE 144	72028
VORITE 1727	72242
VORITE 174	72257
VORITE 1742	72292
VORITE 1748 M1	72241
VORITE 1754	72214
VORITE 1787	72050
VORITE 1788	72052
VORITE 1788 M1	72054
VORITE 1791	90113
VORITE 612	72031
VORITE 612-M2	72033
VORITE 63	72026
VORITE 677 M-10	72038
VORITE 677 M-5	72035
VORITE 677 M-8	72874
VORITE 677 M11	90167
VORITE 677 M3	72034
VORITE 759	72143

- 1.07 Exemptions From Reporting -- If you have provided EPA or another Federal agency with the required information on a CAIR Reporting Form for the listed substance within the past 3 years, and this information is current, accurate, and complete for the time period specified in the rule, then sign the certification below. You are required to complete section 1 of this CAIR form and provide any information now required but not previously submitted. Provide a copy of any previous submissions along with your Section 1 submission.

CBI

☐

"I hereby certify that, to the best of my knowledge and belief, all required information which I have not included in this CAIR Reporting Form has been submitted to EPA within the past 3 years and is current, accurate, and complete for the time period specified in the rule."

N/A	N/A	N/A
NAME	SIGNATURE	DATE SIGNED
N/A	() - N/A	N/A
TITLE	TELEPHONE NO.	DATE OF PREVIOUS SUBMISSION

- 1.08 CBI Certification -- If you have asserted any CBI claims in this report you must certify that the following statements truthfully and accurately apply to all of those confidentiality claims which you have asserted.

CBI

☐

"My company has taken measures to protect the confidentiality of the information, and it will continue to take these measures; the information is not, and has not been, reasonably ascertainable by other persons (other than government bodies) by using legitimate means (other than discovery based on a showing of special need in a judicial or quasi-judicial proceeding) without my company's consent; the information is not publicly available elsewhere; and disclosure of the information would cause substantial harm to my company's competitive position."

N/A	N/A	N/A
NAME	SIGNATURE	DATE SIGNED
N/A	() - N/A	N/A
TITLE	TELEPHONE NO.	

☐ Mark (X) this box if you attach a continuation sheet.

1.09 Facility Identification

Street

City

State

Zip

Other SIC Code[][][][]

Street

City

State

Zip

Employer ID Number[1][3][3][0][8][8][5][0]3

6

1.11 Parent Company Identification

[illegible]

1.12 Technical Contact

CBI Name [S][T][U][A][R][T] [] [C][O][O][P][E][R] [] [] [] [] [] [] [] [] [] [] [] [] [] []
[] Title [R][E][G][U][L][A][T][O][R][Y] [] [A][F][F][A][I][R][S] [] [M][A][N][A][G][E][R] [] [] [] [] [] [] [] [] [] [] [] [] [] []
Address [4][0] [] [A][V][E][N][U][E] [] [A] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] []
Street
[B][A][Y][O][N][N][E] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] []
City
[N][J] [] [7][0][0] [2] -- [] [] [] []
State Zip
Telephone Number [2][0][1] - [8][5][8] - [7][9][0][0]

1.13 This reporting year is from 01 88 to 12 88
Mo. Year Mo. Year

☐ Mark (X) this box if you attach a continuation sheet.

N O T A P P L I C A B L E

[illegible]

Street

City

$[\quad] [\quad]$ $[\quad] [\quad] [\quad] [\quad] [\quad]$ -- $[\quad] [\quad] [\quad] [\quad]$

State

Zip

Employer ID Number[][][][][][][][]

Date of Sale [] [] [] [] [] []
Mo. Day Year

Mo.

Day

Year

[illegible]

Telephone Number[][]-[][]-[][]

N O T A P P L I C A B L E

[illegible]

Street

City

$$[\][\] \quad [\][\][\][\][\][\] \text{--} [\][\][\][\]$$

State

Zip

Employer ID Number[][][][][][][][]

Date of Purchase [] [] [] [] [] []
Mo. Day Year

Mo.

Day

Year

[illegible]

Telephone Number[][]-[][]-[][]

8

1.16 For each classification listed below, state the quantity of the listed substance that was manufactured, imported, or processed at your facility during the reporting year.

CBI
☐ Classification Quantity (kg/yr)

Manufactured -0-

Imported -0-

Processed (include quantity repackaged) 65,830

Of that quantity manufactured or imported, report that quantity:

In storage at the beginning of the reporting year N/A

For on-site use or processing N/A

For direct commercial distribution (including export) N/A

In storage at the end of the reporting year N/A

Of that quantity processed, report that quantity:

In storage at the beginning of the reporting year 8,613

Processed as a reactant (chemical producer) 65,830

Processed as a formulation component (mixture producer) N/A

Processed as an article component (article producer) N/A

Repackaged (including export) N/A

In storage at the end of the reporting year 20,680

☐ Mark (X) this box if you attach a continuation sheet.

1.17 Mixture -- If the listed substance on which you are required to report is a mixture or a component of a mixture, provide the following information for each component chemical. (If the mixture composition is variable, report an average percentage of each component chemical for all formulations.)

[]

Component Name	Supplier Name	Average % Composition by Weight (specify precision, e.g., 45% ± 0.5%)
N/A		
Total		100%

10

2.04 State the quantity of the listed substance that your facility manufactured, imported, or processed during the 3 corporate fiscal years preceding the reporting year in descending order.

CBI

☐ Year ending [1][2] [8][7]
Mo. Year

Quantity manufactured kg

Quantity imported kg

Quantity processed 93,985 kg

Year ending [1][2] [8][6]
Mo. Year

Quantity manufactured kg

Quantity imported kg

Quantity processed 91,374 kg

Year ending [1][2] [8][5]
Mo. Year

Quantity manufactured -0- kg

Quantity imported -0- kg

Quantity processed 57,776 kg

2.05 Specify the manner in which you manufactured the listed substance. Circle all appropriate process types.

CBI

N O T A P P L I C A B L E

☐ Continuous process 1

Semicontinuous process 2

Batch process 3

☐ Mark (X) this box if you attach a continuation sheet.

2.06 Specify the manner in which you processed the listed substance. Circle all appropriate process types.

- ☐ Continuous process 1
- ☐ Semicontinuous process 2
- ☐ Batch process 3

2.07 State your facility's name-plate capacity for manufacturing or processing the listed substance. (If you are a batch manufacturer or batch processor, do not answer this question.)

- ☐ Manufacturing capacity kg/yr
- ☐ Processing capacity NOT APPLICABLE kg/yr
AS ABOVE.

2.08 If you intend to increase or decrease the quantity of the listed substance manufactured, imported, or processed at any time after your current corporate fiscal year, estimate the increase or decrease based upon the reporting year's production volume.

<input type="checkbox"/>	Manufacturing Quantity (kg)	Importing Quantity (kg)	Processing Quantity (kg)
Amount of increase			UNKNOWN
Amount of decrease			UNKNOWN

☐ Mark (X) this box if you attach a continuation sheet.

- 2.11 Related Product Types -- List any byproducts, coproducts, or impurities present with the listed substance in concentrations greater than 0.1 percent as it is manufactured, imported, or processed. The source of byproducts, coproducts, or impurities means the source from which the byproducts, coproducts, or impurities are made or introduced into the product (e.g., carryover from raw material, reaction product, etc.).

CBI

☐

<u>CAS No.</u>	<u>Chemical Name</u>	<u>Byproduct, Coproduct or Impurity¹</u>	<u>Concentration (%) (specify \pm % precision)</u>	<u>Source of By-products, Coproducts, or Impurities</u>
<u>UNKNOWN - IMPURITIES NOT LISTED BY SUPPLIERS ON DATA SHEETS</u>				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

¹Use the following codes to designate byproduct, coproduct, or impurity:

B = Byproduct
C = Coproduct
I = Impurity

☐ Mark (X) this box if you attach a continuation sheet.

- 2.12 Existing Product Types -- List all existing product types which you manufactured, imported, or processed using the listed substance during the reporting year. List the quantity of listed substance you use for each product type as a percentage of the total volume of listed substance used during the reporting year. Also list the quantity of listed substance used captively on-site as a percentage of the value listed under column b., and the types of end-users for each product type. (Refer to ☐ the instructions for further explanation and an example.)

CBI

a. Product Types ¹	b. % of Quantity Manufactured, Imported, or Processed	c. % of Quantity Used Captively On-Site	d. Type of End-Users ²
B	23.7	-0-	I
K	76.3	-0-	CM

¹Use the following codes to designate product types:

A = Solvent	L = Moldable/Castable/Rubber and additives
B = Synthetic reactant	M = Plasticizer
C = Catalyst/Initiator/Accelerator/ Sensitizer	N = Dye/Pigment/Colorant/Ink and additives
D = Inhibitor/Stabilizer/Scavenger/ Antioxidant	O = Photographic/Reprographic chemical and additives
E = Analytical reagent	P = Electrodeposition/Plating chemicals
F = Chelator/Coagulant/Sequestrant	Q = Fuel and fuel additives
G = Cleanser/Detergent/Degreaser	R = Explosive chemicals and additives
H = Lubricant/Friction modifier/Antiwear agent	S = Fragrance/Flavor chemicals
I = Surfactant/Emulsifier	T = Pollution control chemicals
J = Flame retardant	U = Functional fluids and additives
K = Coating/Binder/Adhesive and additives	V = Metal alloy and additives
	W = Rheological modifier
	X = Other (specify) _____

²Use the following codes to designate the type of end-users:

I = Industrial	CS = Consumer
CM = Commercial	H = Other (specify) _____

☐ Mark (X) this box if you attach a continuation sheet.

2.13 Expected Product Types -- Identify all product types which you expect to manufacture, import, or process using the listed substance at any time after your current corporate fiscal year. For each use, specify the quantity you expect to manufacture, import, or process for each use as a percentage of the total volume of listed substance used during the reporting year. Also list the quantity of listed substance used captively on-site as a percentage of the value listed under column b., and the types of end-users for each product type. (Refer to the instructions for further explanation and an example.)

CBI
[]

a.	b.	c.	d.
Product Types ¹	% of Quantity Manufactured, Imported, or Processed	% of Quantity Used Captively On-Site	Type of End-Users ²
	UNKNOWN		

¹Use the following codes to designate product types:

A = Solvent	L = Moldable/Castable/Rubber and additives
B = Synthetic reactant	M = Plasticizer
C = Catalyst/Initiator/Accelerator/ Sensitizer	N = Dye/Pigment/Colorant/Ink and additives
D = Inhibitor/Stabilizer/Scavenger/ Antioxidant	O = Photographic/Reprographic chemical and additives
E = Analytical reagent	P = Electrodeposition/Plating chemicals
F = Chelator/Coagulant/Sequestrant	Q = Fuel and fuel additives
G = Cleanser/Detergent/Degreaser	R = Explosive chemicals and additives
H = Lubricant/Friction modifier/Antiwear agent	S = Fragrance/Flavor chemicals
I = Surfactant/Emulsifier	T = Pollution control chemicals
J = Flame retardant	U = Functional fluids and additives
K = Coating/Binder/Adhesive and additives	V = Metal alloy and additives
	W = Rheological modifier
	X = Other (specify) _____

²Use the following codes to designate the type of end-users:

I = Industrial	CS = Consumer
CM = Commercial	H = Other (specify) _____

[] Mark (X) this box if you attach a continuation sheet.

2.14 Final Product -- Complete the following table for each type of final product manufactured, imported, or processed at your facility that contains the listed substance other than as an impurity.

☐

a.	b.	c.	d.
Product Type ¹	Final Product's Physical Form ²	Average % Composition of Listed Substance in Final Product	Type of End-Users ³
B	L	5.7%	I
K	L	0.3%	CM

¹Use the following codes to designate product types:

A = Solvent	L = Moldable/Castable/Rubber and additives
B = Synthetic reactant	M = Plasticizer
C = Catalyst/Initiator/Accelerator/Sensitizer	N = Dye/Pigment/Colorant/Ink and additives
D = Inhibitor/Stabilizer/Scavenger/Antioxidant	O = Photographic/Reprographic chemical and additives
E = Analytical reagent	P = Electrodeposition/Plating chemicals
F = Chelator/Coagulant/Sequestrant	Q = Fuel and fuel additives
G = Cleanser/Detergent/Degreaser	R = Explosive chemicals and additives
H = Lubricant/Friction modifier/Antiwear agent	S = Fragrance/Flavor chemicals
I = Surfactant/Emulsifier	T = Pollution control chemicals
J = Flame retardant	U = Functional fluids and additives
K = Coating/Binder/Adhesive and additives	V = Metal alloy and additives
	W = Rheological modifier
	X = Other (specify) _____

²Use the following codes to designate the final product's physical form:

A = Gas	F2 = Crystalline solid
B = Liquid	F3 = Granules
C = Aqueous solution	F4 = Other solid
D = Paste	G = Gel
E = Slurry	H = Other (specify) _____
F1 = Powder	

³Use the following codes to designate the type of end-users:

I = Industrial	CS = Consumer
CM = Commercial	H = Other (specify) _____

☐ Mark (X) this box if you attach a continuation sheet.

2.15 Circle all applicable modes of transportation used to deliver bulk shipments of the
CBI listed substance to off-site customers.

☐ Truck N/A 1
Railcar 2
Barge, Vessel 3
Pipeline 4
Plane 5
Other (specify) 6

2.16 Customer Use -- Estimate the quantity of the listed substance used by your customers
CBI or prepared by your customers during the reporting year for use under each category
of end use listed (i-iv).

☐

Category of End Use

i. Industrial Products

Chemical or mixture N/A kg/yr
Article 5,346 kg/yr

ii. Commercial Products

Chemical or mixture 2,277 kg/yr
Article N/A kg/yr

iii. Consumer Products

Chemical or mixture N/A kg/yr
Article N/A kg/yr

iv. Other

Distribution (excluding export) N/A kg/yr
Export N/A kg/yr
Quantity of substance consumed as reactant N/A kg/yr
Unknown customer uses N/A kg/yr

☐ Mark (X) this box if you attach a continuation sheet.

SECTION 3 PROCESSOR RAW MATERIAL IDENTIFICATION

PART A GENERAL DATA

3.01 Specify the quantity purchased and the average price paid for the listed substance for each major source of supply listed. Product trades are treated as purchases.
CBI The average price is the market value of the product that was traded for the listed substance.

☐

<u>Source of Supply</u>	<u>Quantity (kg)</u>	<u>Average Price (\$/kg)</u>
The listed substance was manufactured on-site.	N/A	
The listed substance was transferred from a different company site.	N/A	
The listed substance was purchased directly from a manufacturer or importer.	75,959	\$0.80 to \$0.85
The listed substance was purchased from a distributor or repackager.	N/A	
The listed substance was purchased from a mixture producer.	N/A	

3.02 Circle all applicable modes of transportation used to deliver the listed substance to your facility.

☐

Truck	①
Railcar	2
Barge, Vessel	3
Pipeline	4
Plane	5
Other (specify) _____	6

☐ Mark (X) this box if you attach a continuation sheet.

3.03 a. Circle all applicable containers used to transport the listed substance to your facility.
CBI

☐

Bags 1
Boxes 2
Free standing tank cylinders 3
Tank rail cars 4
Hopper cars 5
Tank trucks (6)
Hopper trucks 7
Drums (8)
Pipeline 9
Other (specify) _____ 10

b. If the listed substance is transported in pressurized tank cylinders, tank rail cars, or tank trucks, state the pressure of the tanks.

Tank cylinders	<u>N/A</u>	mmHg
Tank rail cars	<u>N/A</u>	mmHg
Tank trucks	<u>N/A</u>	mmHg

☐ Mark (X) this box if you attach a continuation sheet.

PART B RAW MATERIAL IN THE FORM OF A MIXTURE

3.04 If you obtain the listed substance in the form of a mixture, list the trade name(s) of the mixture, the name of its supplier(s) or manufacturer(s), an estimate of the average percent composition by weight of the listed substance in the mixture, and the amount of mixture processed during the reporting year.

CBI

☐

<u>Trade Name</u>	<u>Supplier or Manufacturer</u>	<u>Average % Composition by Weight (specify + % precision)</u>	<u>Amount Processed (kg/yr)</u>
NOT APPLICABLE: SINGLE CAS NUMBER			

☐ Mark (X) this box if you attach a continuation sheet.

PART C RAW MATERIAL VOLUME

3.05 State the quantity of the listed substance used as a raw material during the reporting year in the form of a class I chemical, class II chemical, or polymer, and the percent composition, by weight, of the listed substance.

☐

	Quantity Used (kg/yr)	% Composition by Weight of Listed Sub- stance in Raw Material (specify \pm % precision)
Class I chemical	65,830	100%
Class II chemical	N/A	
Polymer	N/A	

☐ Mark (X) this box if you attach a continuation sheet.

SECTION 4 PHYSICAL/CHEMICAL PROPERTIES

General Instructions:

If you are reporting on a mixture as defined in the glossary, reply to questions in Section 4 that are inappropriate to mixtures by stating "NA -- mixture."

For questions 4.06-4.15, if you possess any hazard warning statement, label, MSDS, or other notice that addresses the information requested, you may submit a copy or reasonable facsimile in lieu of answering those questions which it addresses.

PART A PHYSICAL/CHEMICAL DATA SUMMARY

- 4.01 Specify the percent purity for the three major¹ technical grade(s) of the listed substance as it is manufactured, imported, or processed. Measure the purity of the substance in the final product form for manufacturing activities, at the time you import the substance, or at the point you begin to process the substance.

CBI

☐

	<u>Manufacture</u>	<u>Import</u>	<u>Process</u>
Technical grade #1	_____ % purity	_____ % purity	_____ 100 % purity
Technical grade #2	_____ % purity	_____ % purity	_____ % purity
Technical grade #3	_____ % purity	_____ % purity	_____ % purity

¹Major = Greatest quantity of listed substance manufactured, imported or processed.

- 4.02 Submit your most recently updated Material Safety Data Sheet (MSDS) for the listed substance, and for every formulation containing the listed substance. If you possess an MSDS that you developed and an MSDS developed by a different source, submit your version. Indicate whether at least one MSDS has been submitted by circling the appropriate response.

Yes (1)

No 2

Indicate whether the MSDS was developed by your company or by a different source.

Your company (1)

Another source (2)

☒ Mark (X) this box if you attach a continuation sheet.

4.03 Submit a copy or reasonable facsimile of any hazard information (other than an MSDS) that is provided to your customers/users regarding the listed substance or any formulation containing the listed substance. Indicate whether this information has been submitted by circling the appropriate response.

Yes ☒ 1
No 2

4.04 For each activity that uses the listed substance, circle all the applicable number(s) corresponding to each physical state of the listed substance during the activity listed. Physical states for importing and processing activities are determined at the time you import or begin to process the listed substance. Physical states for manufacturing, storage, disposal and transport activities are determined using the final state of the product.

CBI

☐

Activity	Physical State				
	Solid	Slurry	Liquid	Liquified Gas	Gas
Manufacture	1	2	3	4	5
Import	1	2	3	4	5
Process	1	2	<input checked="" type="radio"/> 3	4	5
Store	1	2	<input checked="" type="radio"/> 3	4	5
Dispose	<input checked="" type="radio"/> 1	2	3	4	5
Transport	1	2	3	4	5

☐ Mark (X) this box if you attach a continuation sheet.

4.05 Particle Size -- If the listed substance exists in particulate form during any of the following activities, indicate for each applicable physical state the size and the percentage distribution of the listed substance by activity. Do not include particles ≥ 10 microns in diameter. Measure the physical state and particle sizes for importing and processing activities at the time you import or begin to process the listed substance. Measure the physical state and particle sizes for manufacturing storage, disposal and transport activities using the final state of the product.

CBI

☐

<u>Physical State</u>		<u>N O T A P P L I C A B L E</u>					
		<u>Manufacture</u>	<u>Import</u>	<u>Process</u>	<u>Store</u>	<u>Dispose</u>	<u>Transport</u>
Dust	<1 micron	_____	_____	_____	_____	_____	_____
	1 to <5 microns	_____	_____	_____	_____	_____	_____
	5 to <10 microns	_____	_____	_____	_____	_____	_____
Powder	<1 micron	_____	_____	_____	_____	_____	_____
	1 to <5 microns	_____	_____	_____	_____	_____	_____
	5 to <10 microns	_____	_____	_____	_____	_____	_____
Fiber	<1 micron	_____	_____	_____	_____	_____	_____
	1 to <5 microns	_____	_____	_____	_____	_____	_____
	5 to <10 microns	_____	_____	_____	_____	_____	_____
Aerosol	<1 micron	_____	_____	_____	_____	_____	_____
	1 to <5 microns	_____	_____	_____	_____	_____	_____
	5 to <10 microns	_____	_____	_____	_____	_____	_____

☐ Mark (X) this box if you attach a continuation sheet.

PART A RATE CONSTANTS AND TRANSFORMATION PRODUCTS

a. Photolysis:

Absorption spectrum coefficient (peak) (1/M cm) at _____ nm

Reaction quantum yield, ϕ at nm

Direct photolysis rate constant, k_p , at ... 1/hr latitude

For 1O_2 (singlet oxygen), k_{ox} 1/M hr

For RO_2 (peroxy radical), k_{ox} 1/M hr

c. Five-day biochemical oxygen demand, BOD_5 ... _____ mg/l

For bacterial transformation in water, $k_b \dots$ 1/hr

Specify culture

For base-promoted process, k_R 1/M hr

For acid-promoted process, k_a 1/M hr

For neutral process, k_N 1/hr

f. Chemical reduction rate (specify conditions)

g. Other (such as spontaneous degradation) ...

35

PART B PARTITION COEFFICIENTS

5.02 a. Specify the half-life of the listed substance in the following media.

<u>Media</u>	<u>Half-life (specify units)</u>
Groundwater	UNKNOWN
Atmosphere	
Surface water	
Soil	

b. Identify the listed substance's known transformation products that have a half-life greater than 24 hours.

<u>CAS No.</u>	<u>Name</u>	<u>Half-life (specify units)</u>	<u>Media</u>
	UNKNOWN		in
			in
			in
			in

5.03 Specify the octanol-water partition coefficient, K_{ow} ... at 25°C

Method of calculation or determination UNKNOWN

5.04 Specify the soil-water partition coefficient, K_d UNKNOWN at 25°C

Soil type

5.05 Specify the organic carbon-water partition coefficient, K_{oc} UNKNOWN at 25°C

5.06 Specify the Henry's Law Constant, H UNKNOWN atm-m³/mole

☐ Mark (X) this box if you attach a continuation sheet.

5.07 List the bioconcentration factor (BCF) of the listed substance, the species for which it was determined, and the type of test used in deriving the BCF.

<u>Bioconcentration Factor</u>	<u>Species</u>	<u>Test</u> ¹
	UNKNOWN	

¹Use the following codes to designate the type of test:

F = Flowthrough
S = Static

☐ Mark (X) this box if you attach a continuation sheet.

[]

[]

☐ Mark (X) this box if you attach a continuation sheet.

SECTION 7 MANUFACTURING AND PROCESSING INFORMATION

General Instructions:

For questions 7.04-7.06, provide a separate response for each process block flow diagram provided in questions 7.01, 7.02, and 7.03. Identify the process type from which the information is extracted.

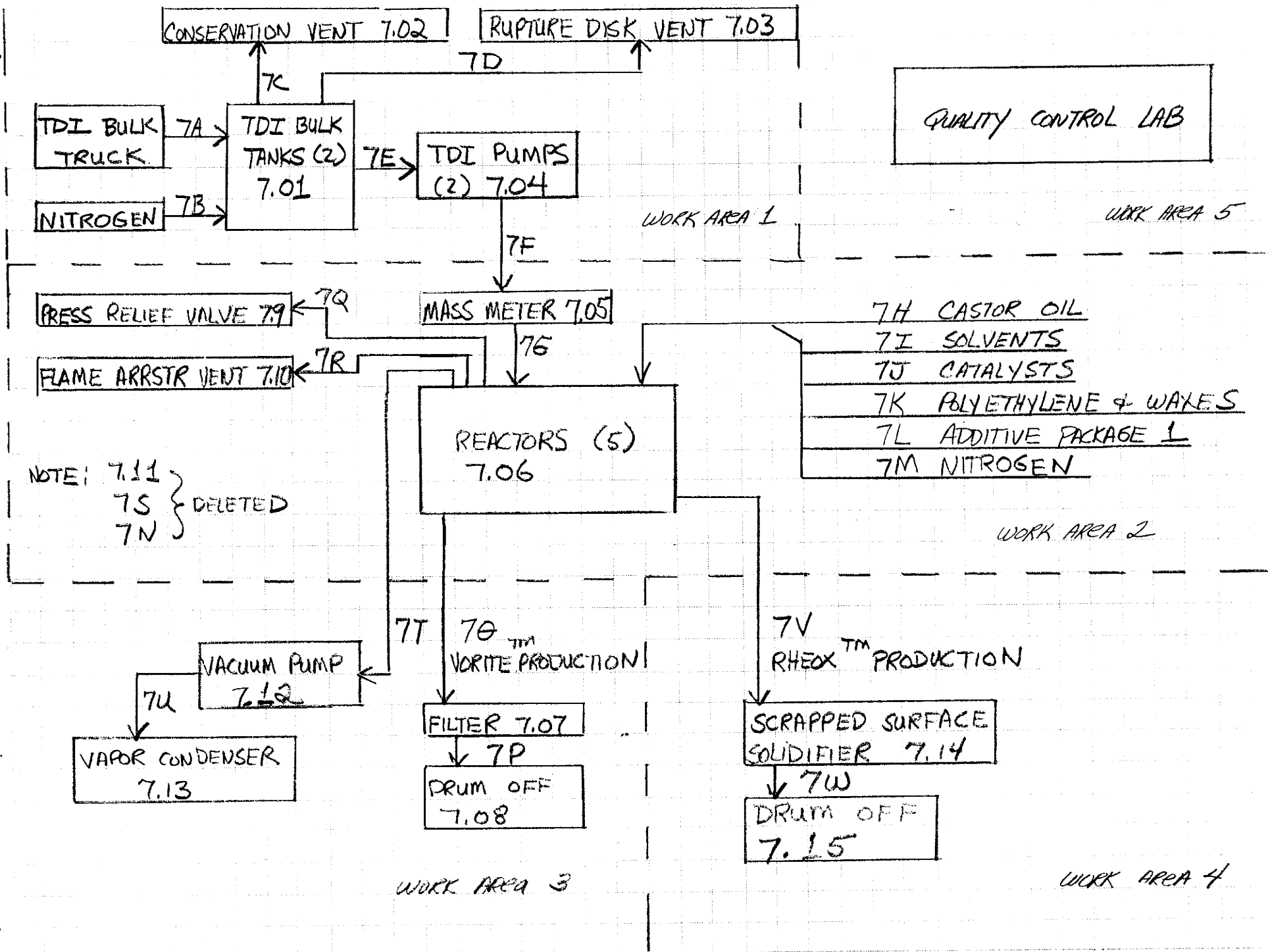
PART A MANUFACTURING AND PROCESSING PROCESS TYPE DESCRIPTION

7.01 In accordance with the instructions, provide a process block flow diagram showing the major (greatest volume) process type involving the listed substance.

CBI

☐ Process type PRODUCTION OF VORITETM & RHEOXTM

☒ Mark (X) this box if you attach a continuation sheet.



7.03 In accordance with the instructions, provide a process block flow diagram showing all process emission streams and emission points that contain the listed substance and which, if combined, would total at least 90 percent of all facility emissions if not treated before emission into the environment. If all such emissions are released from one process type, provide a process block flow diagram using the instructions for question 7.01. If all such emissions are released from more than one process type, provide a process block flow diagram showing each process type as a separate block.

CBI

☐ Process type TM VORITE TM AND RHEOX PRODUCTION

REFER DIAGRAM 7.03

TDI EMISSIONS

7.02 TDI BULK TANK VENT

7.03 RUPTURE DISK

7.10 FLAME ARRESTER VENT

7.09 PRESSURE RELIEF VALVE

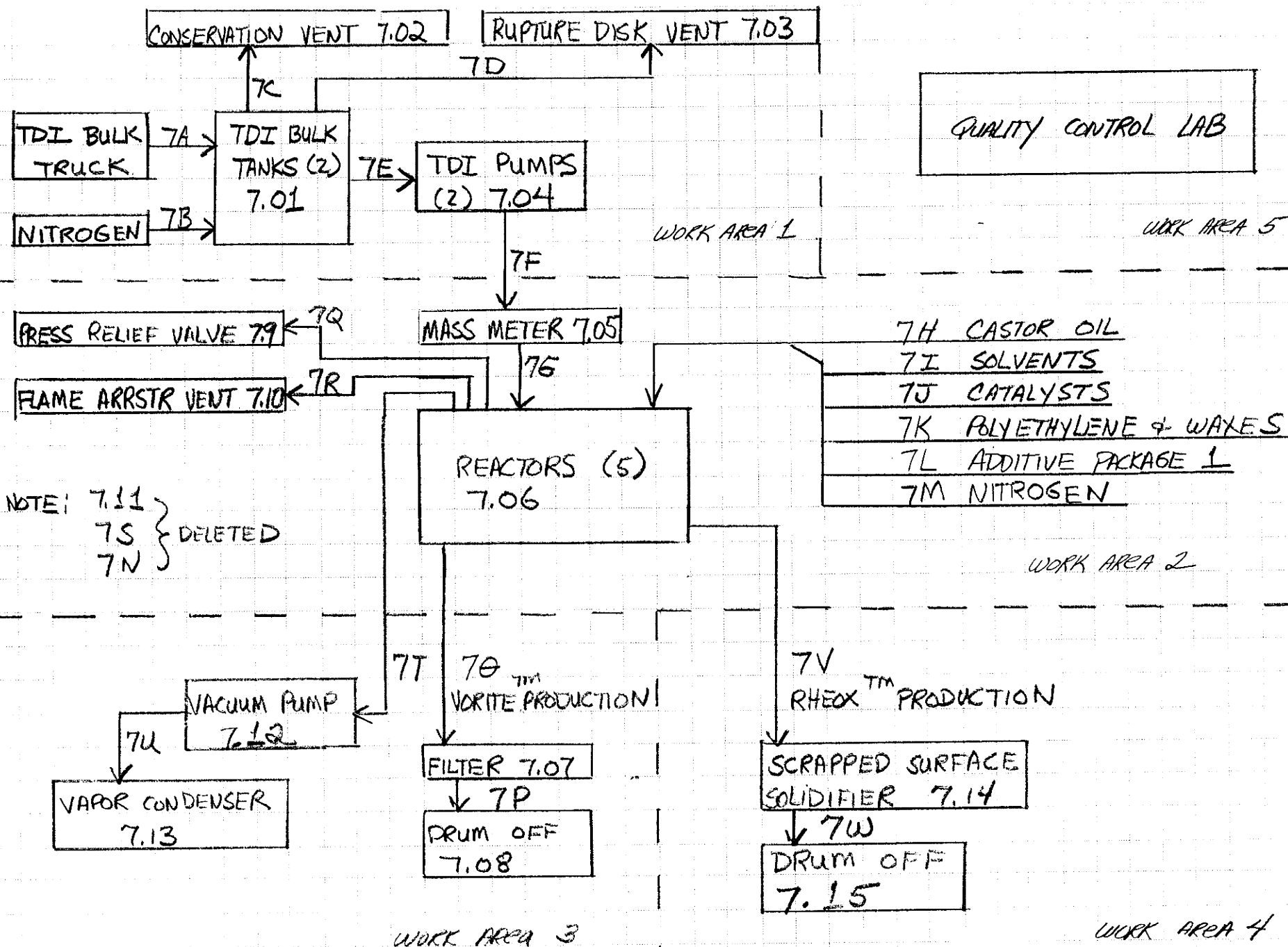
7.13 VAPOR CONDENSER

7.07 VORITE FILTER

7.08 VORITE DRUM OFF

NOTE: ALL TDI IS CONSUMED IN THEOX PRODUCTION, THEREFORE, NO EMISSIONS AT POINTS 7.14 and 7.15.

☐ Mark (X) this box if you attach a continuation sheet.



7.04 Describe the typical equipment types for each unit operation identified in your process block flow diagram(s). If a process block flow diagram is provided for more than one process type, photocopy this question and complete it separately for each process type.

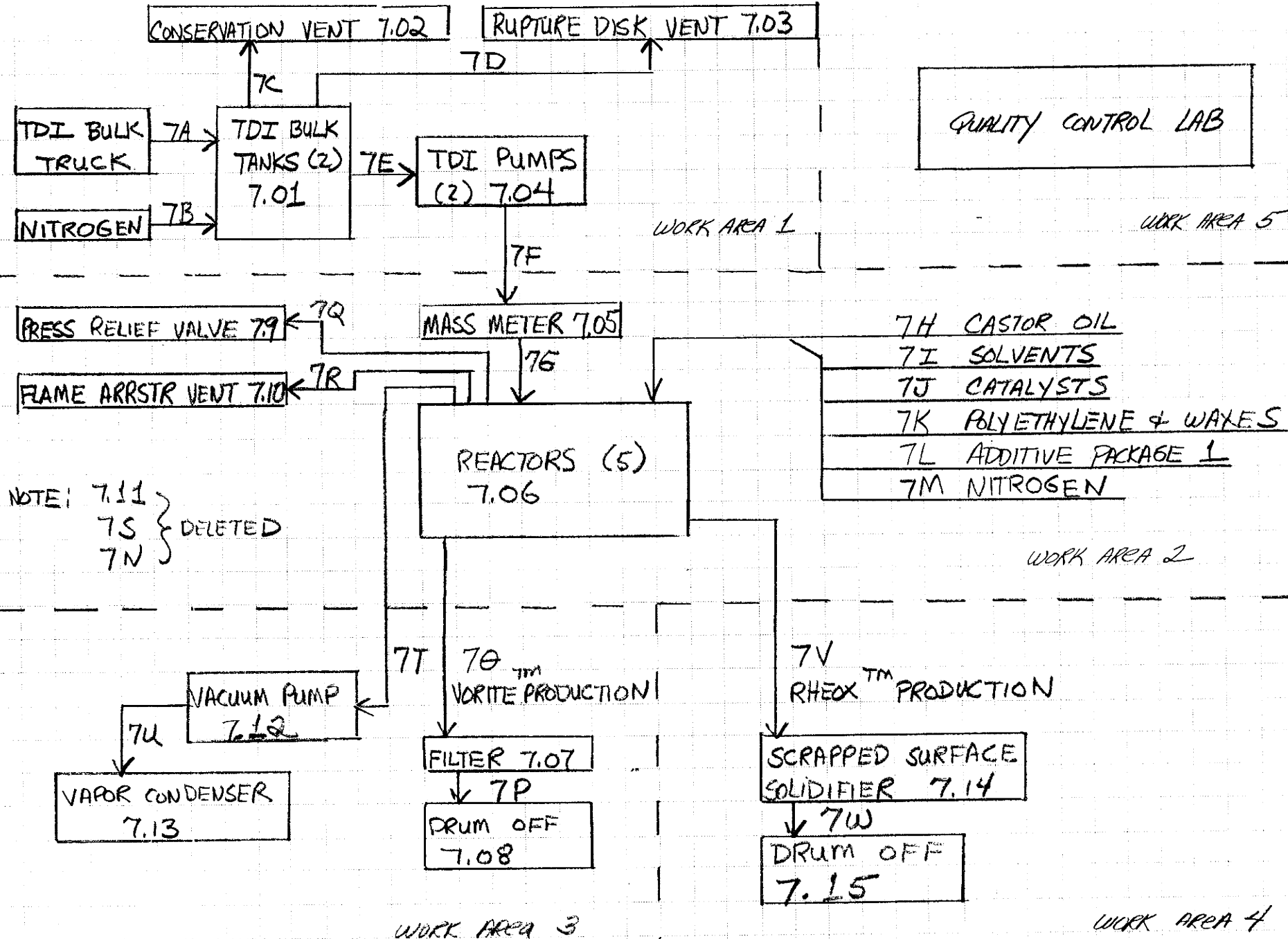
CBI

☐ Process type VORITE AND THEOX PRODUCTION

<u>Unit Operation ID Number</u>	<u>Typical Equipment Type</u>	<u>Operating Temperature Range (°C)</u>	<u>Operating Pressure Range (mm Hg)</u>	<u>Vessel Composition</u>
<u>7.01</u>	<u>Bulk Storage Tank</u>	<u>20-60</u>	<u>760</u>	<u>S.S.</u>
<u>7.02</u>	<u>Conservation Vent</u>	<u>20-60</u>	<u>760-1020</u>	<u>C.S.</u>
<u>7.03</u>	<u>Rupture Disk</u>	<u>20-60</u>	<u>760-1020</u>	<u>C.S.</u>
<u>7.04</u>	<u>TDI Pump</u>	<u>20-60</u>	<u>4000</u>	<u>S.S.</u>
<u>7.05</u>	<u>Mass Meter</u>	<u>20-60</u>	<u>4000</u>	<u>S.S.</u>
<u>7.06</u>	<u>Chemical Reactor</u>	<u>20-100</u>	<u>500-1020</u>	<u>S.S.</u>
<u>7.07</u>	<u>Filter</u>	<u>20-60</u>	<u>1000</u>	<u>S.S.</u>
<u>7.08</u>	<u>Drum Filler</u>	<u>20-60</u>	<u>760</u>	<u>C.S.</u>
<u>7.09</u>	<u>PR V</u>	<u>20-100</u>	<u>760-1020</u>	<u>C.S.</u>
<u>7.10</u>	<u>Flame Arrester</u>	<u>20-100</u>	<u>760-1020</u>	<u>C.S.</u>
<u>7.11</u>	<u>-----DELETED-----</u>			
<u>7.12</u>	<u>Vacuum Pump</u>	<u>20-60</u>	<u>500-760</u>	<u>C.S.</u>
<u>7.13</u>	<u>Vapor Condenser</u>	<u>20-60</u>	<u>760</u>	<u>S.S.</u>
<u>7.14</u>	<u>Votator</u>	<u>20-100</u>	<u>760-4000</u>	<u>S.S.</u>
<u>7.15</u>	<u>Drum Filler</u>	<u>20-60</u>	<u>760</u>	<u>C.S.</u>

S.S. = STAINLESS STEEL
C.S. = CARBON STEEL

☐ Mark (X) this box if you attach a continuation sheet.



7.05 Describe each process stream identified in your process block flow diagram(s). If a process block flow diagram is provided for more than one process type, photocopy this question and complete it separately for each process type.

CBI

☐ Process type VORITETM AND RHEOXTM PRODUCTION

Process Stream ID Code	Process Stream Description	Physical State ¹	Stream Flow (kg/yr)
* 7A	TDI TANK FILLING	OL	75,959
* 7E, 7F, 7G	TDI CHARGE TO REACTOR	OL	65,830
7H	CASTOR OILS CHARGE TO REACTOR	OL	313,331
7I	SOLVENT CHARGE TO REACTOR	OL	213,312
7J, 7L	CATALYSTS AND OTHER ADDITIVE REACTOR CHARGES	OL	30,348
7K	POLYETHYLENE AND WAX CHARGES TO REACTOR	SO	83,445
7Q, 7P	VORITE TM DRUM OFF	OL	506,730
7V, 7W	RHEOX TM DRUM OFF	OL	237,328

¹Use the following codes to designate the physical state for each process stream:

GC = Gas (condensable at ambient temperature and pressure)
 GU = Gas (uncondensable at ambient temperature and pressure)
 SO = Solid
 SY = Sludge or slurry
 AL = Aqueous liquid
 OL = Organic liquid
 IL = Immiscible liquid (specify phases, e.g., 90% water, 10% toluene)

*Note: Ending inventory of TDI Bulk Tank in Fiscal 1988 was greater by 10,129 Kg. than beginning inventory.

☐ Mark (X) this box if you attach a continuation sheet.

7.06 Characterize each process stream identified in your process block flow diagram(s). If a process block flow diagram is provided for more than one process type, photocopy this question and complete it separately for each process type. (Refer to the CBI instructions for further explanation and an example.)

☐ Process type VORITETM AND RHEOXTM PRODUCTION

a.	b.	c.	d.	e.
Process Stream ID Code	Known Compounds ¹	Concentrations ^{2,3} (% or ppm)	Other Expected Compounds	Estimated Concentrations (% or ppm)
7A	TDI	100	N/A	N/A
7B, 7M	NITROGEN	100	N/A	N/A
7C, 7D	NITROGEN	99.9% (E,W)	N/A	N/A
	TDI	0.9ppm (E,W)	N/A	

7.06 continued below

☒ Mark (X) this box if you attach a continuation sheet.

7.06 Characterize each process stream identified in your process block flow diagram(s). If a process block flow diagram is provided for more than one process type, photocopy this question and complete it separately for each process type. (Refer to the CBI instructions for further explanation and an example.)

☐ Process type VORITETM RHEOXTM PRODUCTION

a. Process Stream ID Code	b. Known Compounds ¹	c. Concen- trations ^{2,3} (% or ppm)	d. Other Expected Compounds	e. Estimated Concentrations (% or ppm)
7E, 7F, 7G	TDI	100%	N/A	N/A
7H	CASTOR OILS, Standard and Modified	100%	N/A	N/A
7I	SOLVENTS, INCLUDING a - Methyl Ethyl Ketone b - Mineral Spirits	100%	N/A	N/A

7.06 continued below

☐ Mark (X) this box if you attach a continuation sheet.

7.06 Characterize each process stream identified in your process block flow diagram(s).
 If a process block flow diagram is provided for more than one process type, photocopy
 this question and complete it separately for each process type. (Refer to the
 CBI instructions for further explanation and an example.)

☐ Process type VORITETM / RHEOXTM PRODUCTION

a. Process Stream ID Code	b. Known Compounds ¹	c. Concen- trations ^{2,3} (% or ppm)	d. Other Expected Compounds	e. Estimated Concentrations (% or ppm)
7J	Catalysts, including COTIN 200, COSCAT T-33	100	None	N/A
7K	Polyethylene and Waxes (Pellets and Flakes)	100	N/A	N/A
7O, 7P	Vorites TM	100	N/A	N/A

7.06 continued below

☐ Mark (X) this box if you attach a continuation sheet.

7.06 Characterize each process stream identified in your process block flow diagram(s). If a process block flow diagram is provided for more than one process type, photocopy this question and complete it separately for each process type. (Refer to the CBI instructions for further explanation and an example.)

☐ Process type VORITETM / RHEOXTM PRODUCTION

a. Process Stream ID Code	b. Known Compounds ¹	c. Concen- trations ^{2,3} (% or ppm)	d. Other Expected Compounds	e. Estimated Concentrations (% or ppm)
7Q,7R	NITROGEN	99.9% (EXW)	N/A	N/A
7T,7U	TDI	6.3ppm (EXW)	N/A	N/A
	SOLVENTS, (MEK OR MINERAL SPIRITS)	0.25% (EXW)	N/A	N/A
7O,7P	VORITE TM	100%	N/A	N/A
7V,7W	RHEOX TM	100%	N/A	N/A

☐ Mark (X) this box if you attach a continuation sheet.

7.06 (continued)

¹For each additive package introduced into a process stream, specify the compounds that are present in each additive package, and the concentration of each component. Assign an additive package number to each additive package and list this number in column b. (Refer to the instructions for further explanation and an example. Refer to the glossary for the definition of additive package.)

Additive Package Number	Components of Additive Package	Concentrations (% or ppm)
1	DESMODUR W	100%
	BENZOYL CHLORIDE	100%
	PAPI 901 ISOCYANATE	100%
	AJTRAZON BLUE PYE	100%
	FLEXRICIN 9	100%
	GREEN DISPERSION DYE	100%
	SEE CONTINUATION SHEET FOR MORE DETAILS	

²Use the following codes to designate how the concentration was determined:

A = Analytical result
E = Engineering judgement/calculation

³Use the following codes to designate how the concentration was measured:

V = Volume
W = Weight

☒ Mark (X) this box if you attach a continuation sheet.

7.06 DESCRIPTIONS

ADDITIVE PACKAGE 1

<u>ADDITIVE</u>	<u>CAS NO.</u>	<u>DESCRIPTION</u>	<u>TYPICAL VENDOR</u>
a DESMODUR W	5124-30-1	ALIPHATIC DIISOCYANATE	MODAY
BENZOYL CHLORIDE	100-44-7	AROMATIC HALOGEN	CHEMICAL DYNAMICS CORP.
PAPI 901	26447-40-5 9016-87-9	POLYMERIC ISOCYANATE	DOW
ASTRAZON BLUE DYE	UNKNOWN	SPECIALTY DYE	VERONA DYESTUFF
FLEXRICIN 9	140-04-5	N-BUTYL ACETYL RICINOLEATE	CASCHEM, INC.
GREEN DISPERSION DYE	UNKNOWN	SPECIALTY DYE	VERONA DYESTUFF

PART A RESIDUAL TREATMENT PROCESS DESCRIPTION

8.01 In accordance with the instructions, provide a residual treatment block flow diagram which describes the treatment process used for residuals identified in question 7.01.

CBI

☐ Process type VORITETM AND RHEOXTM PRODUCTION

NOTE: CASCHEM, INC. DOES NOT TREAT WASTES, THEREFORE, SECTION 8 IS NOT APPLICABLE.

☐ Mark (X) this box if you attach a continuation sheet.

8.05 Characterize each process stream identified in your residual treatment block flow diagram(s). If a residual treatment block flow diagram is provided for more than one process type, photocopy this question and complete it separately for each process type. (Refer to the instructions for further explanation and an example.)

[illegible]

☐ Mark (X) this box if you attach a continuation sheet.

8.05 (continued)

¹Use the following codes to designate the type of hazardous waste:

I = Ignitable
C = Corrosive
R = Reactive
E = EP toxic
T = Toxic
H = Acutely hazardous

²Use the following codes to designate the physical state of the residual:

GC = Gas (condensable at ambient temperature and pressure)
GU = Gas (uncondensable at ambient temperature and pressure)
SO = Solid
SY = Sludge or slurry
AL = Aqueous liquid
OL = Organic liquid
IL = Immiscible liquid (specify phases, e.g., 90% water, 10% toluene)

8.05 continued below

☐ Mark (X) this box if you attach a continuation sheet.

8.05 (continued)

³For each additive package introduced into a process stream, specify the compounds that are present in each additive package, and the concentration of each component. Assign an additive package number to each additive package and list this number in column d. (Refer to the instructions for further explanation and an example. Refer to the glossary for the definition of additive package.)

<u>Additive Package Number</u>	<u>Components of Additive Package</u>	<u>Concentrations (% or ppm)</u>
<u>1</u>	N O T A P P L I C A B L E	
<u>2</u>		
<u>3</u>		
<u>4</u>		
<u>5</u>		

⁴Use the following codes to designate how the concentration was determined:

A = Analytical result

E = Engineering judgement/calculation

8.05 continued below

☐ Mark (X) this box if you attach a continuation sheet.

8.05 (continued)

⁵Use the following codes to designate how the concentration was measured:

V = Volume

W = Weight

⁶Specify the analytical test methods used and their detection limits in the table below. Assign a code to each test method used and list those codes in column e.

<u>Code</u>	<u>Method</u>	<u>Detection Limit</u> <u>(± ug/l)</u>
<u>1</u>	<u>N O T A P P L I C A B L E</u>	<u></u>
<u>2</u>	<u></u>	<u></u>
<u>3</u>	<u></u>	<u></u>
<u>4</u>	<u></u>	<u></u>
<u>5</u>	<u></u>	<u></u>
<u>6</u>	<u></u>	<u></u>

☐ Mark (X) this box if you attach a continuation sheet.

CBI

[illegible]

²Use the codes provided in Exhibit 8-2 to designate the management methods

58

8.22 Describe the combustion chamber design parameters for each of the three largest (by capacity) incinerators that are used on-site to burn the residuals identified in your process block or residual treatment block flow diagram(s).

☐

Incinerator	Combustion Chamber Temperature (°C)		Location of Temperature Monitor		Residence Time In Combustion Chamber (seconds)	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
1	RESPONSE NOT REQUIRED FOR TDI					
2						
3						

Indicate if Office of Solid Waste survey has been submitted in lieu of response by circling the appropriate response.

Yes 1

No 2

8.23 Complete the following table for the three largest (by capacity) incinerators that are used on-site to burn the residuals identified in your process block or residual treatment block flow diagram(s).

☐

Incinerator	Air Pollution Control Device ¹	Types of Emissions Data Available
1		
2	N O T A P P L I C A B L E	
3		

Indicate if Office of Solid Waste survey has been submitted in lieu of response by circling the appropriate response.

Yes 1

No 2

¹Use the following codes to designate the air pollution control device:

S = Scrubber (include type of scrubber in parenthesis)

E = Electrostatic precipitator

O = Other (specify) _____

☐ Mark (X) this box if you attach a continuation sheet.

PART A EMPLOYMENT AND POTENTIAL EXPOSURE PROFILE

9.01 Mark (X) the appropriate column to indicate whether your company maintains records on the following data elements for hourly and salaried workers. Specify for each data element the year in which you began maintaining records and the number of years the records for that data element are maintained. (Refer to the instructions for further explanation and an example.)

CBI

☐

Data Element	Data are Maintained for:		Year in Which Data Collection Began	Number of Years Records Are Maintained
	Hourly Workers	Salaried Workers		
Date of hire	X	X	1950	30+yrs
Age at hire	NA	NA	NA	NA
Work history of individual before employment at your facility	X	X	1950	30+
Sex	X	X	1950	30+
Race	X	X	1950	30+
Job titles	X	X	1950	30+
Start date for each job title	X	X	1950	30+
End date for each job title	X	X	1950	30+
Work area industrial hygiene monitoring data	X	X	1977	15
Personal employee monitoring data	NA	NA	NA	NA
Employee medical history	X	X	1950	20+
Employee smoking history	NA	NA	1970	20+
Accident history	X	X	1970	20+
Retirement date	X	X	1950	30+
Termination date	X	X	1950	30+
Vital status of retirees	X	X	1950	30+
Cause of death data	NA	NA	NA	NA

NA= not available

☐ Mark (X) this box if you attach a continuation sheet.

9.02 In accordance with the instructions, complete the following table for each activity in which you engage.

CBI

☐

a.	b.	c.	d.	e.
<u>Activity</u>	<u>Process Category</u>	<u>Yearly Quantity (kg)</u>	<u>Total Workers</u>	<u>Total Worker-Hours</u>
Manufacture of the listed substance	Enclosed	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
	Controlled Release	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
	Open	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
On-site use as reactant	Enclosed	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
	Controlled Release	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
	Open	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
On-site use as nonreactant	Enclosed	<u>744,058</u>	<u>14</u>	<u>6,319</u>
	Controlled Release	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
	Open	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
On-site preparation of products	Enclosed	<u></u>	<u></u>	<u></u>
	Controlled Release	<u></u>	<u></u>	<u></u>
	Open	<u></u>	<u></u>	<u></u>

☐ Mark (X) this box if you attach a continuation sheet.

9.03 Provide a descriptive job title for each labor category at your facility that encompasses workers who may potentially come in contact with or be exposed to the listed substance.

CBI

☐

Labor Category

Descriptive Job Title

A

559.130-010 * CHEMICAL PROCESSING SUPERVISOR

B

559.382-018 * CHEMICAL OPERATOR III

C

QUALITY CONTROL TECHNICIAN

D

E

F

G

H

I

J

* - U.S. Dept. of Labor Dictionary of Occupational Titles .

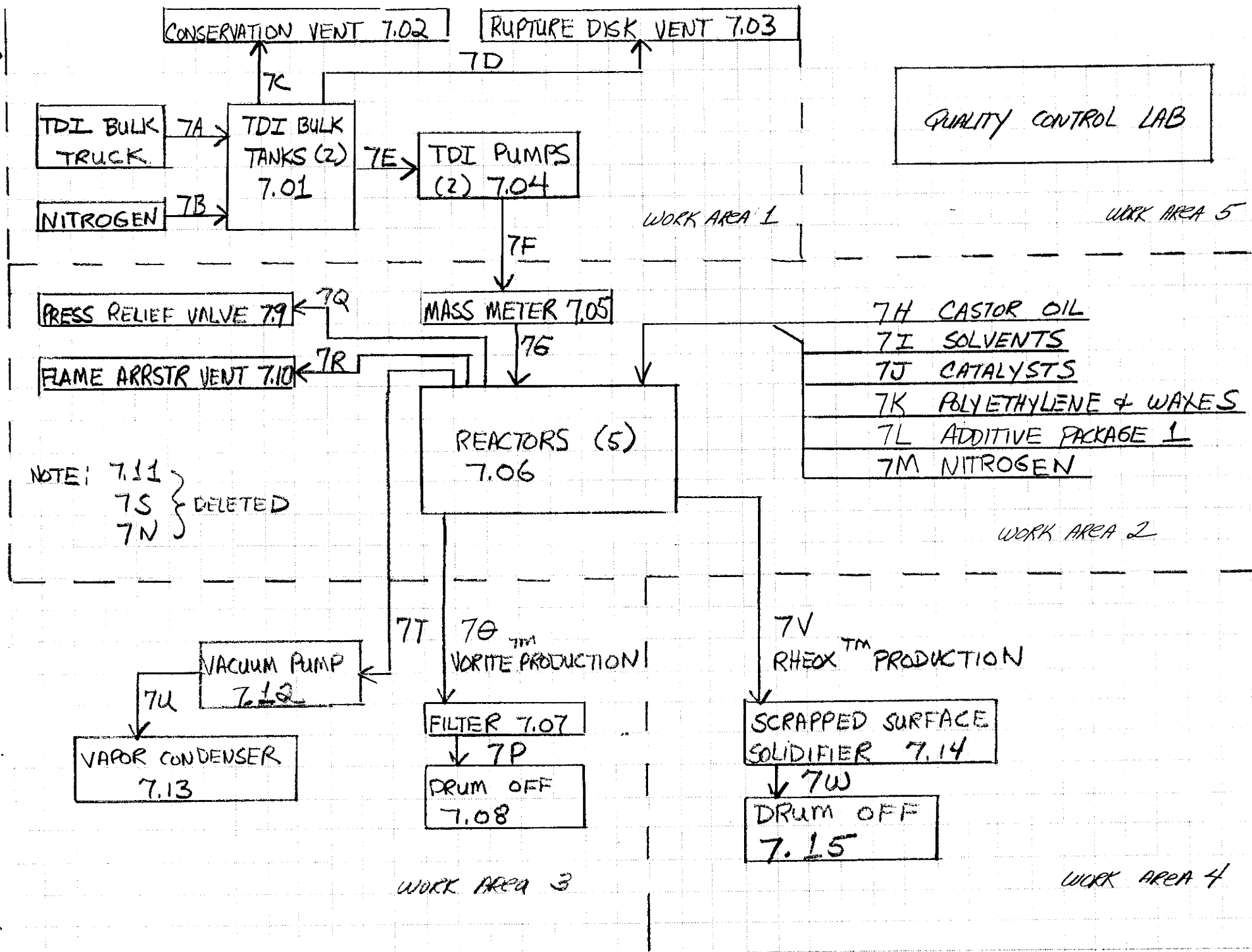
☐ Mark (X) this box if you attach a continuation sheet.

9.04 In accordance with the instructions, provide your process block flow diagram(s) and indicate associated work areas.

CBI

☐ Process type SEE CONTINUATION SHEET

☒ Mark (X) this box if you attach a continuation sheet.



9.05 Describe the various work area(s) shown in question 9.04 that encompass workers who may potentially come in contact with or be exposed to the listed substance. Add any additional areas not shown in the process block flow diagram in question 7.01 or 7.02. Photocopy this question and complete it separately for each process type.

CBI

☐ Process type PRODUCTION OF VORITETM AND RHEOXTM

<u>Work Area ID</u>	<u>Description of Work Areas and Worker Activities</u>
1	<u>BULK STORAGE, PUMPING</u>
2	<u>REACTOR AND ASSOCIATED SYSTEMS</u>
3	<u>VORITETM PRODUCT FILLING STATION</u>
4	<u>RHEOXTM PRODUCT SOLIDIFICATION AND FILLING</u>
5	<u>QUALITY CONTROL LABORATORY</u>
6	<u></u>
7	<u></u>
8	<u></u>
9	<u></u>
10	<u></u>

☐ Mark (X) this box if you attach a continuation sheet.

9.06 Complete the following table for each work area identified in question 9.05, and for each labor category at your facility that encompasses workers who may potentially come in contact with or be exposed to the listed substance. Photocopy this question and complete it separately for each process type and work area.

☐ Process type VORITE AND RHEOX PRODUCTION

Work area 1

Labor Category	Number of Workers Exposed	Mode of Exposure (e.g., direct skin contact)	Physical State of Listed Substance ¹	Average Length of Exposure Per Day ²	Number of Days per Year Exposed
A, B	9	Direct Skin Contact	OL	A	260
A, B	9	Inhalation	GU	A	260

¹Use the following codes to designate the physical state of the listed substance at the point of exposure:

GC = Gas (condensable at ambient temperature and pressure)	SY = Sludge or slurry
GU = Gas (uncondensable at ambient temperature and pressure; includes fumes, vapors, etc.)	AL = Aqueous liquid
SO = Solid	OL = Organic liquid
	IL = Immiscible liquid (specify phases, e.g., 90% water, 10% toluene)

²Use the following codes to designate average length of exposure per day:

A = 15 minutes or less	D = Greater than 2 hours, but not exceeding 4 hours
B = Greater than 15 minutes, but not exceeding 1 hour	E = Greater than 4 hours, but not exceeding 8 hours
C = Greater than one hour, but not exceeding 2 hours	F = Greater than 8 hours

☒ Mark (X) this box if you attach a continuation sheet.

9.06. Complete the following table for each work area identified in question 9.05, and for each labor category at your facility that encompasses workers who may potentially come in contact with or be exposed to the listed substance. Photocopy this question and complete it separately for each process type and work area.

☐ Process type VORITE & RHEOX PRODUCTION

Work area 2

Labor Category	Number of Workers Exposed	Mode of Exposure (e.g., direct skin contact)	Physical State of Listed Substance ¹	Average Length of Exposure Per Day ²	Number of Days per Year Exposed
A	3	Direct Skin Contact	OL	B	260
B	14	Direct Skin Contact	GU	E	260
A	3	Inhalation	GU	B	260
B	14	Inhalation	GU	E	260

¹Use the following codes to designate the physical state of the listed substance at the point of exposure:

GC = Gas (condensable at ambient temperature and pressure)
 GU = Gas (uncondensable at ambient temperature and pressure; includes fumes, vapors, etc.)
 SO = Solid

SY = Sludge or slurry
 AL = Aqueous liquid
 OL = Organic liquid
 IL = Immiscible liquid (specify phases, e.g., 90% water, 10% toluene)

²Use the following codes to designate average length of exposure per day:

A = 15 minutes or less
 B = Greater than 15 minutes, but not exceeding 1 hour
 C = Greater than one hour, but not exceeding 2 hours

D = Greater than 2 hours, but not exceeding 4 hours
 E = Greater than 4 hours, but not exceeding 8 hours
 F = Greater than 8 hours

☒ Mark (X) this box if you attach a continuation sheet.

9.06 Complete the following table for each work area identified in question 9.05, and for each labor category at your facility that encompasses workers who may potentially come in contact with or be exposed to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITE PRODUCTION

Work area 3

Labor Category	Number of Workers Exposed	Mode of Exposure (e.g., direct skin contact)	Physical State of Listed Substance ¹	Average Length of Exposure Per Day ²	Number of Days per Year Exposed
<u>A</u>	<u>3</u>	<u>Direct Skin Contact</u>	<u>OL</u>	<u>B</u>	<u>260</u>
<u>B</u>	<u>5</u>	<u>Direct Skin Contact</u>	<u>OL</u>	<u>C</u>	<u>260</u>
<u>A</u>	<u>3</u>	<u>Inhalation</u>	<u>GU</u>	<u>B</u>	<u>260</u>
<u>B</u>	<u>5</u>	<u>Inhalation</u>	<u>GU</u>	<u>C</u>	<u>260</u>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

¹Use the following codes to designate the physical state of the listed substance at the point of exposure:

GC = Gas (condensable at ambient temperature and pressure)
 GU = Gas (uncondensable at ambient temperature and pressure; includes fumes, vapors, etc.)
 SO = Solid

SY = Sludge or slurry
 AL = Aqueous liquid
 OL = Organic liquid
 IL = Immiscible liquid (specify phases, e.g., 90% water, 10% toluene)

²Use the following codes to designate average length of exposure per day:

A = 15 minutes or less
 B = Greater than 15 minutes, but not exceeding 1 hour
 C = Greater than one hour, but not exceeding 2 hours

D = Greater than 2 hours, but not exceeding 4 hours
 E = Greater than 4 hours, but not exceeding 8 hours
 F = Greater than 8 hours

☒ Mark (X) this box if you attach a continuation sheet.

9.06 Complete the following table for each work area identified in question 9.05, and for each labor category at your facility that encompasses workers who may potentially come in contact with or be exposed to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type RHEOX PRODUCTION

Work area 4

Labor Category	Number of Workers Exposed	Mode of Exposure (e.g., direct skin contact)	Physical State of Listed Substance ¹	Average Length of Exposure Per Day ²	Number of Days per Year Exposed
A	3	Direct Skin Contact	OL	B	90
B	9	Direct Skin Contact	OL	C	90
A	3	Inhalation	GU	B	90
B	9	Inhalation	GU	C	90

¹Use the following codes to designate the physical state of the listed substance at the point of exposure:

GC = Gas (condensable at ambient temperature and pressure)
 GU = Gas (uncondensable at ambient temperature and pressure; includes fumes, vapors, etc.)
 SO = Solid

SY = Sludge or slurry
 AL = Aqueous liquid
 OL = Organic liquid
 IL = Immiscible liquid (specify phases, e.g., 90% water, 10% toluene)

²Use the following codes to designate average length of exposure per day:

A = 15 minutes or less
 B = Greater than 15 minutes, but not exceeding 1 hour
 C = Greater than one hour, but not exceeding 2 hours

D = Greater than 2 hours, but not exceeding 4 hours
 E = Greater than 4 hours, but not exceeding 8 hours
 F = Greater than 8 hours

☒ Mark (X) this box if you attach a continuation sheet.

9.06 Complete the following table for each work area identified in question 9.05, and for each labor category at your facility that encompasses workers who may potentially come in contact with or be exposed to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITETM RHEOXTM PRODUCTION

Work area 5

Labor Category	Number of Workers Exposed	Mode of Exposure (e.g., direct skin contact)	Physical State of Listed Substance ¹	Average Length of Exposure Per Day ²	Number of Days per Year Exposed
C	6	Direct Skin Contact	OL	B	260
C	6	Inhalation	GU	B	260

¹Use the following codes to designate the physical state of the listed substance at the point of exposure:

GC = Gas (condensable at ambient temperature and pressure)	SY = Sludge or slurry
GU = Gas (uncondensable at ambient temperature and pressure; includes fumes, vapors, etc.)	AL = Aqueous liquid
SO = Solid	OL = Organic liquid
	IL = Immiscible liquid (specify phases, e.g., 90% water, 10% toluene)

²Use the following codes to designate average length of exposure per day:

A = 15 minutes or less	D = Greater than 2 hours, but not exceeding 4 hours
B = Greater than 15 minutes, but not exceeding 1 hour	E = Greater than 4 hours, but not exceeding 8 hours
C = Greater than one hour, but not exceeding 2 hours	F = Greater than 8 hours

☐ Mark (X) this box if you attach a continuation sheet.

9.07 For each labor category represented in question 9.06, indicate the 8-hour Time Weighted Average (TWA) exposure levels and the 15-minute peak exposure levels. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORTETM AND RHEOXTM PRODUCTION

Work area 1

<u>Labor Category</u>	<u>8-hour TWA Exposure Level (ppm, mg/m³, other-specify)</u>	<u>15-Minute Peak Exposure Level (ppm, mg/m³, other-specify)</u>
<u>A</u>	<u>.003 ppm*</u>	<u>.006 ppm*</u>
<u>B</u>	<u>.003 ppm*</u>	<u>.006 ppm*</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
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<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

* DATA FROM 1977. EXPOSURE BELIEVED LESS
THAN THIS IN 1988.

☒ Mark (X) this box if you attach a continuation sheet.

CBI

Work area 2

* DATA FROM 1979

☒ Mark (X) this box if you attach a continuation sheet.

CBI

Work area 3

* DATA FROM 1979.

94 - C

9.07 For each labor category represented in question 9.06, indicate the 8-hour Time Weighted Average (TWA) exposure levels and the 15-minute peak exposure levels. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type RHEOX PRODUCTION

Work area 4

<u>Labor Category</u>	<u>8-hour TWA Exposure Level (ppm, mg/m³, other-specify)</u>	<u>15-Minute Peak Exposure Level (ppm, mg/m³, other-specify)</u>
A	.001 ppm	.002 ppm
B	.001 ppm	.002 ppm

ABOVE DATA FROM 1977.

☒ Mark (X) this box if you attach a continuation sheet.

CBI

Work area 5

☐ Mark (X) this box if you attach a continuation sheet.

PART B WORK PLACE MONITORING PROGRAM

9.08 If you monitor worker exposure to the listed substance, complete the following table.

CBI

☐

<u>Sample/Test</u>	<u>Work Area ID</u>	<u>Testing Frequency (per year)</u>	<u>Number of Samples (per test)</u>	<u>Who Samples¹</u>	<u>Analyzed In-House (Y/N)</u>	<u>Number of Years Records Maintained</u>
Personal breathing zone	N					
General work area (air)	1-5	1	2	A	Y	>10
Wipe samples	N					
Adhesive patches	N					
Blood samples	N					
Urine samples	N					
Respiratory samples	N					
Allergy tests	N					
Other (specify)						
Other (specify)						
Other (specify)						

¹Use the following codes to designate who takes the monitoring samples:

A = Plant industrial hygienist

B = Insurance carrier

C = OSHA consultant

D = Other (specify) _____

☐ Mark (X) this box if you attach a continuation sheet.

9.09 For each sample type identified in question 9.08, describe the type of sampling and analytical methodology used for each type of sample.

☐ Sample Type Sampling and Analytical Methodology

GENERAL WORK AREA

DRAGER PUMP AND TUBES

9.10 If you conduct personal and/or ambient air monitoring for the listed substance, specify the following information for each equipment type used.

CBI

<input type="checkbox"/> <u>Equipment Type</u> ¹	<u>Detection Limit</u> ²	<u>Manufacturer</u>	<u>Averaging Time (hr)</u>	<u>Model Number</u>
<u>E</u>	<u>A</u>	<u>MDA</u>	<u>0.1</u>	<u>TLD-1</u>
<u>A</u>	<u>A</u>	<u>GMD SYSTEMS</u>	<u>8</u>	<u>550-21</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

¹Use the following codes to designate personal air monitoring equipment types:

A = Passive dosimeter

B = Detector tube

C = Charcoal filtration tube with pump

D = Other (specify) _____

Use the following codes to designate ambient air monitoring equipment types:

E = Stationary monitors located within work area

F = Stationary monitors located within facility

G = Stationary monitors located at plant boundary

H = Mobile monitoring equipment (specify) _____

I = Other (specify) _____

²Use the following codes to designate detection limit units:

A = ppm

B = Fibers/cubic centimeter (f/cc)

C = Micrograms/cubic meter (μm^3)

☐ Mark (X) this box if you attach a continuation sheet.

9.11 If you conduct routine medical tests for monitoring the health effects of exposure to the listed substance, specify the type and frequency of the tests.

CBI

☐

Test Description

Frequency
(weekly, monthly, yearly, etc.)

PULMONARY FUNCTION

Yearly

CHEST XRAY

Yearly

BLOOD PRESSURE

Yearly

☐ Mark (X) this box if you attach a continuation sheet.

PART C ENGINEERING CONTROLS

9.12 Describe the engineering controls that you use to reduce or eliminate worker exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITETM AND RHEOXTM PRODUCTION

Work area 2

<u>Engineering Controls</u>	<u>Used (Y/N)</u>	<u>Year Installed</u>	<u>Upgraded (Y/N)</u>	<u>Year Upgraded</u>
Ventilation:				
Local exhaust	<u>Y</u>	<u>1972</u>	<u>N</u>	<u>N/A</u>
General dilution	<u>Y</u>	<u>1972</u>	<u>N</u>	<u>N/A</u>
Other (specify)				
<u>MANWAY EXHAUST</u>	<u>Y</u>	<u>1972</u>	<u>N</u>	<u>N/A</u>
Vessel emission controls	<u>Y</u>	<u>1972</u>	<u>N</u>	<u>N/A</u>
Mechanical loading or packaging equipment	<u>N</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Other (specify)				
<u>WELDED/FLANGED PIPE</u>	<u>Y</u>	<u>1972</u>	<u>Y</u>	<u>1989</u>

☒ Mark (X) this box if you attach a continuation sheet.

PART C ENGINEERING CONTROLS

9.12 Describe the engineering controls that you use to reduce or eliminate worker exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITETM PRODUCTION

Work area 3

<u>Engineering Controls</u>	<u>Used (Y/N)</u>	<u>Year Installed</u>	<u>Upgraded (Y/N)</u>	<u>Year Upgraded</u>
Ventilation:				
Local exhaust	<u>Y</u>	<u>1972</u>	<u>N</u>	<u>N/A</u>
General dilution	<u>Y</u>	<u>1972</u>	<u>N</u>	<u>N/A</u>
Other (specify) _____	<u>N</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Vessel emission controls	<u>N</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Mechanical loading or packaging equipment	<u>N</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Other (specify) _____				
FILLER EXHAUST	<u>Y</u>	<u>1972</u>	<u>N</u>	<u>N/A</u>

☒ Mark (X) this box if you attach a continuation sheet.

PART C ENGINEERING CONTROLS

9.12 Describe the engineering controls that you use to reduce or eliminate worker exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type RHEOXTM PRODUCTION

Work area 4

Engineering Controls	Used (Y/N)	Year Installed	Upgraded (Y/N)	Year Upgraded
Ventilation:				
Local exhaust	Y	1976	N	N/A
General dilution	Y	1976	N	N/A
Other (specify)				
	N	N/A	N/A	N/A
Vessel emission controls	N	N/A	N/A	N/A
Mechanical loading or packaging equipment	N	N/A	N/A	N/A
Other (specify)				
	N	N/A	N/A	N/A

☒ Mark (X) this box if you attach a continuation sheet.

PART C ENGINEERING CONTROLS

9.12 Describe the engineering controls that you use to reduce or eliminate worker exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITE™ AND RHEOX™ PRODUCTION

Work area 5

Engineering Controls	Used (Y/N)	Year Installed	Upgraded (Y/N)	Year Upgraded
Ventilation:				
Local exhaust	Y	1979	N	N/A
General dilution	Y	1979	N	N/A
Other (specify)				
Vessel emission controls				
Mechanical loading or packaging equipment				
Other (specify)				
FUME HOODS	Y	1979	N	N/A

☐ Mark (X) this box if you attach a continuation sheet.

9.13 Describe all equipment or process modifications you have made within the 3 years prior to the reporting year that have resulted in a reduction of worker exposure to the listed substance. For each equipment or process modification described, state the percentage reduction in exposure that resulted. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITE RHEOX PRODUCTION

Work area 1

<u>Equipment or Process Modification</u>	<u>Reduction in Worker Exposure Per Year (%)</u>
<u>a. PROVIDED WELDED AND FLANGED PIPE WHEREVER PRACTICAL.</u>	<u>ACTUAL REDUCTION</u>
<u>b. INSTALLED IMPROVED HI-LEVEL SENSORS AND ALARMS.</u>	<u>NOT QUANTIFIED</u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>

☒ Mark (X) this box if you attach a continuation sheet.

9.13 Describe all equipment or process modifications you have made within the 3 years prior to the reporting year that have resulted in a reduction of worker exposure to the listed substance. For each equipment or process modification described, state the percentage reduction in exposure that resulted. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITETM RHEOXTM PRODUCTION

Work area 2

Equipment or Process Modification	Reduction in Worker Exposure Per Year (%)
a. PROVIDED WELDED/FLANGED PIPE WHERE PRACTICAL.	REDUCTION NOT QUANTIFIED
b. REPLACED FLOWMETER W/SEALESS MASSMETER	REDUCTION NOT QUANTIFIED

☒ Mark (X) this box if you attach a continuation sheet.

9.13 Describe all equipment or process modifications you have made within the 3 years prior to the reporting year that have resulted in a reduction of worker exposure to the listed substance. For each equipment or process modification described, state the percentage reduction in exposure that resulted. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITE™ PRODUCTION

Work area 3

Equipment or Process Modification	Reduction in Worker Exposure Per Year (%)
NONE SINCE 1972	N/A

☒ Mark (X) this box if you attach a continuation sheet.

9.13 Describe all equipment or process modifications you have made within the 3 years prior to the reporting year that have resulted in a reduction of worker exposure to the listed substance. For each equipment or process modification described, state the percentage reduction in exposure that resulted. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type RHEOX PRODUCTION

Work area 4

<u>Equipment or Process Modification</u>	<u>Reduction in Worker Exposure Per Year (%)</u>
a. <u>PROVIDED WELDED AND FLANGED PIPING WHEREVER PRACTICAL</u>	<u>REDUCTION NOT QUANTIFIED.</u>
b. <u>MOATED TANK TO CONTAIN POTENTIAL TANK RUPTURE.</u>	<u>REDUCTION NOT QUANTIFIED</u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>

☒ Mark (X) this box if you attach a continuation sheet.

9.13 Describe all equipment or process modifications you have made within the 3 years prior to the reporting year that have resulted in a reduction of worker exposure to the listed substance. For each equipment or process modification described, state the percentage reduction in exposure that resulted. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITE AND RHEOX PRODUCTION

Work area 5

Equipment or Process Modification	Reduction in Worker Exposure Per Year (%)
NONE IN THE PAST 3 YEARS	UNKNOWN

☐ Mark (X) this box if you attach a continuation sheet.

PART D PERSONAL PROTECTIVE AND SAFETY EQUIPMENT

9.14 Describe the personal protective and safety equipment that your workers wear or use in each work area in order to reduce or eliminate their exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

[] Process type VORITE & RHEOX PRODUCTION

Work area 1

<u>Equipment Types</u>	<u>Wear or Use (Y/N)</u>
Respirators	<u>Y* AIR SUPPLIED</u>
Safety goggles/glasses	<u>Y</u>
Face shields	<u>Y</u>
Coveralls	<u>Y*</u>
Bib aprons	<u>N</u>
Chemical-resistant gloves	<u>Y*</u>
Other (specify)	
<u>SAFETY SHOES</u>	<u>Y</u>
<u>EYEWASH & SAFETY SHOWER</u>	<u>Y*</u>

* AS NEEDED

[X] Mark (X) this box if you attach a continuation sheet.

PART D PERSONAL PROTECTIVE AND SAFETY EQUIPMENT

9.14 Describe the personal protective and safety equipment that your workers wear or use in each work area in order to reduce or eliminate their exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

[] Process type VORITETM AND RHEOXTM PRODUCTION

Work area 2

<u>Equipment Types</u>	<u>Wear or Use (Y/N)</u>
Respirators	<u>Y* AIR SUPPLIED</u>
Safety goggles/glasses	<u>Y</u>
Face shields	<u>Y</u>
Coveralls	<u>Y*</u>
Bib aprons	<u>N</u>
Chemical-resistant gloves	<u>Y*</u>
Other (specify)	
<u>SAFETY SHOES</u>	<u>Y</u>
<u>EYEWASH & SAFETY SHOWER</u>	<u>Y*</u>

* AS REQUIRED

[X] Mark (X) this box if you attach a continuation sheet.

PART D PERSONAL PROTECTIVE AND SAFETY EQUIPMENT

9.14 Describe the personal protective and safety equipment that your workers wear or use in each work area in order to reduce or eliminate their exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITE PRODUCTION

Work area 3

<u>Equipment Types</u>	<u>Wear or Use (Y/N)</u>
Respirators	<u>Y AIR SUPPLIED *</u>
Safety goggles/glasses	<u>Y</u>
Face shields	<u>Y</u>
Coveralls	<u>Y*</u>
Bib aprons	<u>N</u>
Chemical-resistant gloves	<u>Y*</u>
Other (specify)	
<u>SAFETY SHOES</u>	<u>Y</u>
<u>EYEWASH & SAFETY SHOWERS</u>	<u>Y*</u>

* AS NEEDED

☒ Mark (X) this box if you attach a continuation sheet.

PART D. PERSONAL PROTECTIVE AND SAFETY EQUIPMENT

9.14 Describe the personal protective and safety equipment that your workers wear or use in each work area in order to reduce or eliminate their exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type RHEOX PRODUCTION

Work area 4

<u>Equipment Types</u>	<u>Wear or Use (Y/N)</u>
Respirators	<u>Y*</u>
Safety goggles/glasses	<u>Y</u>
Face shields	<u>Y</u>
Coveralls	<u>Y*</u>
Bib aprons	<u>N</u>
Chemical-resistant gloves	<u>Y*</u>
Other (specify)	
<u>SAFETY SHOES</u>	<u>Y</u>
<u>EYEWASH & SHOWER</u>	<u>Y*</u>

* AS NECESSARY

☒ Mark (X) this box if you attach a continuation sheet.

PART D PERSONAL PROTECTIVE AND SAFETY EQUIPMENT

9.14 Describe the personal protective and safety equipment that your workers wear or use in each work area in order to reduce or eliminate their exposure to the listed substance. Photocopy this question and complete it separately for each process type and work area.

CBI

☐ Process type VORITE AND RHEOX PRODUCTION

Work area 5

<u>Equipment Types</u>	<u>Wear or Use (Y/N)</u>
Respirators	<u>Y*</u>
Safety goggles/glasses	<u>Y</u>
Face shields	<u>Y</u>
Coveralls	<u>Y</u>
Bib aprons	<u>N</u>
Chemical-resistant gloves	<u>Y</u>
Other (specify)	
<u>SAFETY SHOES</u>	<u>Y</u>
<u>EYEWASH AND SAFETY SHOWER</u>	<u>Y</u>

☐ Mark (X) this box if you attach a continuation sheet.

9.15 If workers use respirators when working with the listed substance, specify for each process type, the work areas where the respirators are used, the type of respirators used, the average usage, whether or not the respirators were fit tested, and the type and frequency of the fit tests. Photocopy this question and complete it separately for each process type.

CBI

☐ Process type PRODUCTION OF VORITETM AND RHEOXTM

Work Area	Respirator Type	Average Usage ¹	Fit Tested (Y/N)	Type of Fit Test ²	Frequency of Fit Tests (per year)
1	SUPPLIED AIR POS. PRESS.	E	Y	QL	1
2	SUPPLIED AIR POS. PRESS.	E	Y	QL	1
3	SUPPLIED AIR POS. PRESS.	E	Y	QL	1
4	ORGANIC VAPOR CARTRIDGE	E	Y	QL	1
5	ORGANIC VAPOR CARTRIDGE	E	Y	QL	1

ALL RESPIRATORS NIOSH/OSHA APPROVED.

¹Use the following codes to designate average usage:

A = Daily

B = Weekly

C = Monthly

D = Once a year

E = Other (specify) NO ROUTINE OR AVERAGE USEAGE, PROVIDED FOR EMERGENCY USE ONLY.

²Use the following codes to designate the type of fit test:

QL = Qualitative

QT = Quantitative

☐ Mark (X) this box if you attach a continuation sheet.

PART E WORK PRACTICES

9.19 Describe all of the work practices and administrative controls used to reduce or eliminate worker exposure to the listed substance (e.g., restrict entrance only to authorized workers, mark areas with warning signs, insure worker detection and monitoring practices, provide worker training programs, etc.). Photocopy this question and complete it separately for each process type and work area.

CBI

☐

Process type VORITETM AND RHEOXTM PRODUCTION

Work area 1-5 (ALL)

1. LIMITED ACCESS.
2. PLACARDING
3. RESPIRATORY PROTECTION
4. MONITORS AND ALARMS
5. TRAINING AND SAFETY MEETINGS
6. CHANGING ROOMS AND LAUNDERING SERVICE.
7. DEDICATED JOB FUNCTION

9.20 Indicate (X) how often you perform each housekeeping task used to clean up routine leaks or spills of the listed substance. Photocopy this question and complete it separately for each process type and work area.

Process type

Work area

<u>Housekeeping Tasks</u>	<u>Less Than Once Per Day</u>	<u>1-2 Times Per Day</u>	<u>3-4 Times Per Day</u>	<u>More Than 4 Times Per Day</u>
Sweeping				
Vacuuming		N/A		
Water flushing of floors				
Other (specify)				
<u>X</u>				

NO LEAKS ARE TOLERATED. NO ROUTINE LEAKS OR SPILLS OCCUR. LEAKS ARE REPAIRED IMMEDIATELY. NO RELEASES IN REPORTING YEAR AND YEAR PREVIOUS.

☐

Mark (X) this box if you attach a continuation sheet.

9.21 Do you have a written medical action plan for responding to routine or emergency exposure to the listed substance?

Routine exposure

Yes 1

No 2

Emergency exposure

Yes 1

No 2

If yes, where are copies of the plan maintained?

Routine exposure: _____

Emergency exposure: _____

9.22 Do you have a written leak and spill cleanup plan that addresses the listed substance? Circle the appropriate response.

☒ Yes 1

No 2

If yes, where are copies of the plan maintained? 1. REGULATORY AFFAIRS OFFICE
2. WORK AREAS 1 THRU 5

Has this plan been coordinated with state or local government response organizations? Circle the appropriate response.

☒ Yes 1

No 2

9.23 Who is responsible for monitoring worker safety at your facility? Circle the appropriate response.

Plant safety specialist 1

Insurance carrier 2

OSHA consultant 3

Other (specify) _____ 4

☐ Mark (X) this box if you attach a continuation sheet.

SECTION 10 ENVIRONMENTAL RELEASE

General Instructions:

Complete Part E (questions 10.23-10.35) for each non-routine release involving the listed substance that occurred during the reporting year. Report on all releases that are equal to or greater than the listed substance's reportable quantity value, RQ, unless the release is federally permitted as defined in 42 U.S.C. 9601, or is specifically excluded under the definition of release as defined in 40 CFR 302.3(22). Reportable quantities are codified in 40 CFR Part 302. If the listed substance is not a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and, thus, does not have an RQ, then report releases that exceed 2,270 kg. If such a substance however, is designated as a CERCLA hazardous substance, then report those releases that are equal to or greater than the RQ. The facility may have answered these questions or similar questions under the Agency's Accidental Release Information Program and may already have this information readily available. Assign a number to each release and use this number throughout this part to identify the release. Releases over more than a 24-hour period are not single releases, i.e., the release of a chemical substance equal to or greater than an RQ must be reported as a separate release for each 24-hour period the release exceeds the RQ.

For questions 10.25-10.35, answer the questions for each release identified in question 10.23. Photocopy these questions and complete them separately for each release.

PART A GENERAL INFORMATION

10.01 Where is your facility located? Circle all appropriate responses.

CBI

- ☐ Industrial area ①
- Urban area 2
- Residential area 3
- Agricultural area 4
- Rural area 5
- Adjacent to a park or a recreational area 6
- Within 1 mile of a navigable waterway ⑦
- Within 1 mile of a school, university, hospital, or nursing home facility ⑧
- Within 1 mile of a non-navigable waterway 9
- Other (specify) _____ 10

☐ Mark (X) this box if you attach a continuation sheet.

10.02 Specify the exact location of your facility (from central point where process unit is located) in terms of latitude and longitude or Universal Transverse Mercader (UTM) coordinates.

Latitude 40 ° 39 ' 00 "

Longitude 74 ° 08 ' 30 "

UTM coordinates Zone N/A , Northing N/A , Easting N/A

10.03 If you monitor meteorological conditions in the vicinity of your facility, provide the following information.

Average annual precipitation RESPONSE NOT REQUIRED FOR TDI inches/year

Predominant wind direction

10.04 Indicate the depth to groundwater below your facility.

Depth to groundwater RESPONSE NOT REQUIRED FOR TDI meters

10.05 For each on-site activity listed, indicate (Y/N/NA) all routine releases of the listed substance to the environment. (Refer to the instructions for a definition of CBI Y, N, and NA.)

☒ [X]

On-Site Activity	Environmental Release		
	Air	Water	Land
Manufacturing	N/A	N/A	N/A
Importing	N/A	N/A	N/A
Processing	Y	N	N
Otherwise used	N/A	N/A	N/A
Product or residual storage	Y	N	Y
Disposal	N/A	N/A	N/A
Transport	N/A	N/A	N/A

☐ Mark (X) this box if you attach a continuation sheet.

10.06 Provide the following information for the listed substance and specify the level of precision for each item. (Refer to the instructions for further explanation and an example.)

CBI

☐ Quantity discharged to the air 0.5 to 227 kg/yr \pm 10 %

Quantity discharged in wastewaters N/A kg/yr \pm %

Quantity managed as other waste in on-site
treatment, storage, or disposal units N/A kg/yr \pm %

Quantity managed as other waste in off-site
treatment, storage, or disposal units 5537 kg/yr \pm 10 %

Source: SARA 313 form R for 1988

☐ Mark (X) this box if you attach a continuation sheet.

10.08 Describe the control technologies used to minimize release of the listed substance for each process stream containing the listed substance as identified in your process block or residual treatment block flow diagram(s). Photocopy this question and complete it separately for each process type.

CBI

☐ Process type VORITETM AND RHEOXTM PRODUCTION

<u>Stream ID Code</u>	<u>Control Technology</u>	<u>Percent Efficiency</u>
7C	CONSERVATION VENT	100%
7U	VAPOR CONDENSER & SCRUBBER	98%

☐ Mark (X) this box if you attach a continuation sheet.

PART B RELEASE TO AIR

10.09 Point Source Emissions -- Identify each emission point source containing the listed substance in terms of a Stream ID Code as identified in your process block or residual treatment block flow diagram(s), and provide a description of each point source. Do not include raw material and product storage vents, or fugitive emission sources (e.g., equipment leaks). Photocopy this question and complete it separately for each process type.

CBI

☐

Process type VORITETM RHEOXTM PRODUCTION

Point Source
ID Code

Description of Emission Point Source

7Q

REACTOR VENT VIA PRESSURE RELIEF VALVE

7R

REACTOR VENT THRU FLAME ARRESTER

7J, 7L, 7P

{

REACTOR MANWAY, DRUM OFF STATION FUME

HOOD SYSTEM

7U

VACUUM PUMP EXHAUST

NOTE: DRUM OFF STATION FOR RHEOX (7W) N/A AS LISTED SUBSTANCE DOES NOT EXIST AT THIS POINT IN THE PROCESS.

☐ Mark (X) this box if you attach a continuation sheet.

☐ Mark (X) this box if you attach a continuation sheet.

10.10 Emission Characteristics - Characterize the emissions for each Point Source ID Code identified in question 10.09 by completing the following table.

CBI

☐

Point Source ID Code	Physical State ¹	Average Emissions (kg/day)	Frequency ² (days/yr)	Duration ³ (min/day)	Average Emission Factor ⁴	Maximum Emission Rate (kg/min)	Maximum Emission Rate Frequency (events/yr)	Maximum Emission Rate Duration (min/event)
7Q	G	0	260	0	0	.0006	-0-	N/A
7R	G	.03	260	960	13 ppm	.0006	UNKNOWN	UNKNOWN
7J	G	<.0001	260	300	< .1 ppm	<.0001	260	300
7L								
7P								
7U	G	<0.01	260	60	≤ 2 ppm	.0006	260	60

¹Use the following codes to designate physical state at the point of release:

G = Gas; V = Vapor; P = Particulate; A = Aerosol; O = Other (specify) _____

²Frequency of emission at any level of emission

³Duration of emission at any level of emission

⁴Average Emission Factor — Provide estimated (± 25 percent) emission factor (kg of emission per kg of production of listed substance)

10.11 Stack Parameters -- Identify the stack parameters for each Point Source ID Code identified in question 10.09 by completing the following table.

CBI

☐

Point Source ID Code	Stack Height(m)	Stack Inner Diameter (at outlet) (m)	Exhaust Temperature (°C)	Emission Exit Velocity (m/sec)	Building Height(m) ¹	Building Width(m) ²	Vent, Type ³
7Q	9.2	.05	*N/A	*N/A	10	24	V
7R	9.2	.05	45-75	0.04	10	24	V
7J, 7L, 7P	9.2	.25	20	13.0	10	24	H
7U	9.2	.05	20	2.5	10	48	V
* PRESSURE RELIEF SAFETY VALVE DID NOT ACTIVATE DURING REPORTING YEAR.							

¹Height of attached or adjacent building

²Width of attached or adjacent building

³Use the following codes to designate vent type:

H = Horizontal

V = Vertical

☐ Mark (X) this box if you attach a continuation sheet.

10.12 If the listed substance is emitted in particulate form, indicate the particle size distribution for each Point Source ID Code identified in question 10.09.
Photocopy this question and complete it separately for each emission point source.

CBI

☐

Point source ID code

Size Range (microns)

Mass Fraction (% \pm % precision)

< 1

≥ 1 to < 10

≥ 10 to < 30

≥ 30 to < 50

≥ 50 to < 100

≥ 100 to < 500

≥ 500

N O T A P P L I C A B L E

☐ Mark (X) this box if you attach a continuation sheet.

PART C FUGITIVE EMISSIONS

10.13 Equipment Leaks -- Complete the following table by providing the number of equipment types listed which are exposed to the listed substance and which are in service according to the specified weight percent of the listed substance passing through the component. Do this for each process type identified in your process block or residual treatment block flow diagram(s). Do not include equipment types that are not exposed to the listed substance. If this is a batch or intermittently operated process, give an overall percentage of time per year that the process type is exposed to the listed substance. Photocopy this question and complete it separately for each process type.

CBI

☐ Process type VORITETM RHEOXTM PRODUCTION

Percentage of time per year that the listed substance is exposed to this process type 100 %

Equipment Type	Number of Components in Service by Weight Percent of Listed Substance in Process Stream					Greater than 99%
	Less than 5%	5-10%	11-25%	26-75%	76-99%	
Pump seals ¹						
Packed	NOTE: CANNED PUMP, NO SEALS					0
Mechanical						0
Double mechanical ²						0
Compressor seals ¹						0
Flanges						90
Valves						
Gas ³						7
Liquid						25
Pressure relief devices ⁴ (Gas or vapor only)						14
Sample connections						
Gas						0
Liquid						5
Open-ended lines ⁵ (e.g., purge, vent)						
Gas						0
Liquid						0

¹List the number of pump and compressor seals, rather than the number of pumps or compressors

10.13 continued on next page

☐ Mark (X) this box if you attach a continuation sheet.

10.13 (continued)

²If double mechanical seals are operated with the barrier (B) fluid at a pressure greater than the pump stuffing box pressure and/or equipped with a sensor (S) that will detect failure of the seal system, the barrier fluid system, or both, indicate with a "B" and/or an "S", respectively

³Conditions existing in the valve during normal operation

⁴Report all pressure relief devices in service, including those equipped with control devices

⁵Lines closed during normal operation that would be used during maintenance operations

10.14 Pressure Relief Devices with Controls -- Complete the following table for those pressure relief devices identified in 10.13 to indicate which pressure relief devices in service are controlled. If a pressure relief device is not controlled, enter "None" under column c.

CBI
[]

a. Number of Pressure Relief Devices	b. Percent Chemical in Vessel ¹	c. Control Device	d. Estimated Control Efficiency ²
7	100%	RUPTURE DISKS	100%
7	100%	PRESSURE RELIEF VALVES	100%

¹Refer to the table in question 10.13 and record the percent range given under the heading entitled "Number of Components in Service by Weight Percent of Listed Substance" (e.g., <5%, 5-10%, 11-25%, etc.)

²The EPA assigns a control efficiency of 100 percent for equipment leaks controlled with rupture discs under normal operating conditions. The EPA assigns a control efficiency of 98 percent for emissions routed to a flare under normal operating conditions

[] Mark (X) this box if you attach a continuation sheet.

10.15 Equipment Leak Detection -- If a formal leak detection and repair program is in place, complete the following table regarding those leak detection and repair procedures. Photocopy this question and complete it separately for each process type.

CBI

☐ Process type

Equipment Type	Leak Detection	Detection Device ¹	Frequency of Leak Detection (per year)	Repairs Initiated (days after detection)	Repairs Completed (days after initiated)
	Concentration (ppm or mg/m ³) Measured at _____ Inches from Source				
Pump seals					
Packed	_____	_____	_____	_____	_____
Mechanical	_____	_____	_____	_____	_____
Double mechanical	_____	_____	_____	_____	_____
Compressor seals	_____	_____	_____	_____	_____
Flanges	_____	_____	_____	_____	_____
Valves					
Gas	NOT	A P P L I C A B L E	_____	_____	_____
Liquid	_____	_____	_____	_____	_____
Pressure relief devices (gas or vapor only)	_____	_____	_____	_____	_____
Sample connections					
Gas	_____	_____	_____	_____	_____
Liquid	_____	_____	_____	_____	_____
Open-ended lines					
Gas	_____	_____	_____	_____	_____
Liquid	_____	_____	_____	_____	_____

¹Use the following codes to designate detection device:

POVA = Portable organic vapor analyzer

FPM = Fixed point monitoring

0 = Other (specify) _____

☐ Mark (X) this box if you attach a continuation sheet.

☐ Mark (X) this box if you attach a continuation sheet.

10.16 Raw Material, Intermediate and Product Storage Emissions - - Complete the following table by providing the information on each liquid raw material, intermediate, and product storage vessel containing the listed substance as identified in your process block or residual treatment block flow diagram(s).

CBI

☐

								Operat- ing						
	Vessel Type ¹	Floating Roof ² Seals	Composition of Stored ³ Materials	Throughput (liters per year)	Vessel Filling Rate (gpm)	Vessel Filling Duration (min)	Vessel Inner Diameter (m)	Vessel Height (m)	Vessel Volume (l)	Vessel Emission Controls ⁴	Design Flow ⁵ Rate	Vent Diameter (cm)	Control Efficiency (%)	Basis for Estimate ⁶
RHEOX	HF	N/A	100	1900	50	120	2.4	5.2	22800	PRV	N/A	5.1	100	C
VORITE	VF	N/A	100	52120	50	120	2.4	5.2	22800	PRV	N/A	5.1	100	C

HF = HORIZONTAL CYLINDRICAL FIXED ROOF.

VF = VERTICAL CYLINDRICAL FIXED ROOF.

PRV = PRESSURE RELIEF VALVES.

¹Use the following codes to designate vessel type:

F = Fixed roof
CIF = Contact internal floating roof
NCIF = Noncontact internal floating roof
EFR = External floating roof
P = Pressure vessel (indicate pressure rating)
H = Horizontal
U = Underground

²Use the following codes to designate floating roof seals:

MS1 = Mechanical shoe, primary
MS2 = Shoe-mounted secondary
MS2R = Rim-mounted, secondary
LM1 = Liquid-mounted resilient filled seal, primary
LM2 = Rim-mounted shield
LMW = Weather shield
VM1 = Vapor mounted resilient filled seal, primary
VM2 = Rim-mounted secondary
VMW = Weather shield

³Indicate weight percent of the listed substance. Include the total volatile organic content in parenthesis

⁴Other than floating roofs

⁵Gas/vapor flow rate the emission control device was designed to handle (specify flow rate units)

⁶Use the following codes to designate basis for estimate of control efficiency:

C = Calculations
S = Sampling

PART E NON-ROUTINE RELEASES

10.23 Indicate the date and time when the release occurred and when the release ceased or was stopped. If there were more than six releases, attach a continuation sheet and list all releases.

<u>Release</u>	<u>Date Started</u>	<u>Time (am/pm)</u>	<u>Date Stopped</u>	<u>Time (am/pm)</u>
<u>1</u>	NO RELEASES OCCURRED DURING REPORTING YEAR.			
<u>2</u>				
<u>3</u>				
<u>4</u>				
<u>5</u>				
<u>6</u>				

10.24 Specify the weather conditions at the time of each release.

<u>Release</u>	<u>Wind Speed (km/hr)</u>	<u>Wind Direction</u>	<u>Humidity (%)</u>	<u>Temperature (°C)</u>	<u>Precipitation (Y/N)</u>
<u>1</u>	RESPONSE NOT REQUIRED FOR TDI				
<u>2</u>					
<u>3</u>					
<u>4</u>					
<u>5</u>					
<u>6</u>					

☐ Mark (X) this box if you attach a continuation sheet.

- 10.25 Complete the following information for each media into which the listed substance was released. Any volatile substance that was released to land, but that was expected to volatilize, should be listed as a release to air.

Release No.

<u>Media</u>	<u>Quantity (kg)</u>	<u>Method of Release</u>	<u>Migration Beyond Boundaries (Y/N)</u>	<u>Quantity Migrated (kg)</u>
Land	_____	_____	_____	_____
Air	_____	_____	_____	_____
Groundwater	_____	_____	_____	_____
Surface water	_____	_____	_____	_____

- 10.26 Specify the physical state and concentration of the listed substance at the time and point of release.

Release No.

Point of release

Physical state

Concentration (%)

☐ Mark (X) this box if you attach a continuation sheet.

10.27 Circle all appropriate responses relating to the cause and the effects of the release.

Release No.

Cause of Release

Equipment failure 1
Operator error 2
Bypass condition 3
Upset condition 4
Fire 5
Unknown 6
Other (specify) 7

Results of Release

Spill 1
Vapor release 2
Explosion 3
Fire 4
Other (specify) 5

☐ Mark (X) this box if you attach a continuation sheet.

10.28 Specify which authorities were notified of the release.

Release No.

a. Federal

Agency

Office [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] []

Contact Person [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] []

[illegible]

City

[]
State

Telephone Number () () () - () () () - () () () ()

Date Notified [] [] [] [] [] []
Mo. Day Year

Time Notified [] [] [] [] am/pm

b. State

Agency

Office [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] []

Contact Person []

[illegible]

City

State

Telephone Number [] [] [] - [] [] [] - [] [] [] []

Date Notified
Mo. Day Year

Time Notified [] [] [] [] am/pm

10.28 continued below

☐ Mark (X) this box if you attach a continuation sheet.

10.28 (continued)

c. Local

Agency

Office

Contact Person

Address
Street

City

State

Telephone Number --

Date Notified
Mo. Day Year

Time Notified am/pm

10.29 For each of the proximities listed below, indicate whether the population living within that proximity was notified of, or evacuated because of the release. Specify who notified the population, the number of people evacuated, if any, and the date and time of day the evacuation began.

Release No:

Proximity to the Release	Notified of Release (Y/N)	Notifying Person	Notifying Person's Telephone Number	Area Evacuated (Y/N)	Number of Persons Evacuated	Date and Time of Day Evacuation Began
1/4 mile	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
1/2 mile	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
1 mile	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other (specify)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

☐ Mark (X) this box if you attach a continuation sheet.

10.30 Specify the number of personal injuries or casualties resulting from the release.

Release No.

Number of injuries to facility employees _____

Number of injuries to general population

Number of deaths to facility employees

Number of deaths to general population

10.31 Indicate who conducted cleanup activities, and the dates over which the cleanup was performed.

Release No.

Name

[illegible]

City

 --
State Zip

Telephone Number [] [] [] - [] [] [] - [] [] [] []

Date Cleanup Initiated
Mo. Year

Date Cleanup Completed (or expected) [] [] [] []
Mo. Year

10.32 Briefly describe the release prevention practices and policies (backup systems, containment systems, training programs, etc.) in place at the facility at the time the release occurred.

Release No.

☐ Mark (X) this box if you attach a continuation sheet.

10.33 Indicate which of the prevention practices and policies listed in question 10.32 were ineffective in preventing the release from reaching the environment.

Release No.

10.34 Describe all repairs and/or preventive measures (management practices, operational changes, etc.) made to equipment or operations as a result of the release.

Release No.

10.35 Describe additional preventive measures that will be taken to minimize the possibilities of recurrence.

Release No.

☐ Mark (X) this box if you attach a continuation sheet.

APPENDIX I: List of Continuation Sheets

Attach continuation sheets for sections of this form and optional information after this page. In column 1, clearly identify the continuation sheet by listing the question number to which it relates. In column 2, enter the inclusive page numbers of the continuation sheet for each question number.

Question Number (1)	Continuation Sheet Page Numbers (2)
1.04 ^b TRADE NAMES OF PRODUCTS	1
4.02 MSDS's OF PRODUCTS	2.01 to 2.23
4.03 TECHNICAL BULLETIN 100	3
7.01 PROCESS FLOW DIAGRAM	REPORT INSERTION -Pg.42A
7.03 PROCESS FLOW DIAGRAM	" " -Pg.44A
7.06 PROCESS STREAM CHARACTERIZATION	" " -Pgs.47A-D
7.06 ADDITIVE PACKAGE DESCRIPTION	" " -Pg.48A
9.04 ASSOCIATED WORK AREAS	" " -Pg.91A
9.06 WORK AREA TABLES	" " -Pgs.93A-E
9.12 ENGINEERING CONTROLS	" " -Pgs.98A-E
9.13 MODIFICATIONS	" " -Pgs.99A-E
9.14 PERSONAL PROTECTIVE EQUIPMENT	" " -Pgs100A-E

☐ Mark (X) this box if you attach a continuation sheet.

CASCHEM, INC.

CAIR REPORT

104.b Continuation Sheet

Trade Names of CasChem Products with Residual TDI:

<u>TRADE NAME</u>	<u>PRODUCT CODE</u>
DYNAFLEX 202-3C	72302
DYNAFLEX 443	72305
DYNAFLEX 513	72306
DYNAFLEX 403	72304
DYNAFLEX 760	72308
EV 68-28	90149
VORITE 128	72027
VORITE 128 M2	72040
VORITE 144	72028
VORITE 1727	72242
VORITE 174	72257
VORITE 1742	72292
VORITE 1748 M1	72241
VORITE 1754	72214
VORITE 1787	72050
VORITE 1788	72052
VORITE 1788 M1	72054
VORITE 1791	90113
VORITE 612	72031
VORITE 612-M2	72033
VORITE 63	72026
VORITE 677 M-10	72038
VORITE 677 M-5	72035
VORITE 677 M-8	72874
VORITE 677 M11	90167
VORITE 677 M3	72034
VORITE 759	72143

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: DYNAFLEX 202-3C
Product Code: 72302
Product Class: Prepolymer
Chemical Abstract Number: 9057-91-4

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 2 Protective Code: G
Threshold Limit Value (TLV):
No TLV has been established for this product. See section II.
Printed Date: 09/20/89 Revision Date: 07/21/86

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Toluene Diisocyanate (TDI)		<2	0.005	0.04 TWA	88' AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	
2-Ethoxyethyl Acetate		<1	5	27	
	111-15-9		1988	AGCIH	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: <1
Density (lb/gal): 8.7
Appearance: Transparent liquid

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Combustible liquid N.O.S.

(Cont. Pet. Dis

Flash Point: 167 F

Extinguishing Media: Foam, carbon dioxide, dry chemical

Unusual fire and explosion hazards: keep the container tightly sealed
and away from heat, sparks and open flame.

Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended
to protect from products of combustion.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, alcohols, and amines.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of nitrogen and isocyanate vapors.

Hazardous Polymerization: may occur

Section VI: Health Hazard Data

Primary routes of entry: Inhalation, eyes, absorption by skin.
Ingestion is possible though unlikely.

Effects of over exposure:

Acute: Skin contact may cause irritation, sensitization, and allergic reactions. Inhalation can cause mucous membrane irritation, chest tightening, coughing, headache, and shortness of breath. Eye contact can cause severe irritation. Ingestion can cause irritation and possible corrosive action on the mouth and stomach tissue. Vomiting may occur.

Chronic: Some individuals may develop sensitivity leading to asthma-like symptoms on subsequent exposures below the TLV. Excessive exposure can produce serious and possibly irreversible pulmonary injury.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water, get medical attention.

Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. If redness and irritation continue, call a physician.

Ingestion - get immediate medical attention. Dilute with milk or water. DO NOT INDUCE VOMITING.

Inhalation - remove to fresh air. Give oxygen if needed. Consult a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: personnel who will clean the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbent. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with federal, state, and local regulations.

Section VIII: Special Protection Information

tion to maintain airborne concentrations below TLV.
Protective Gloves: chemical resistant gloves should be worn.
Eye Protection; safety goggles should be worn.
Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials and moisture. Blanket partially used contents with nitrogen.
Other Precautions: do not transfer into unmarked containers.

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

2.02

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: DYNAFLEX 443
Product Code: 72305
Product Class: Prepolymer
Chemical Abstract Number: 9057-91-4

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 2 Protective Code: G

Threshold Limit Value (TLV):

None has been established at this time. See section II.

Printed Date: 09/20/89

Revision Date: 07/21/86

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Toluene Diisocyanate (TDI)		<1	0.005	0.04 TWA	88' AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	
Xylene		<3	100	435	6.0
	1330-20-7		1988	AGCIH	
Mineral Spirits		<3			2.0
			118	Suggestd	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: <6
Density (lb/gal): 8.7
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category:

Flash Point: 165 F

Extinguishing Media: Foam, carbon dioxide, dry chemical

Unusual fire and explosion hazards: keep the container tightly sealed
and away from heat, sparks and open flame.

Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended
to protect from products of combustion.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, alcohols, and amines.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of nitrogen and isocyanate vapors.

Hazardous Polymerization: may occur

Section VI: Health Hazard Data

Primary routes of entry: Inhalation, eyes, absorption by skin.
Ingestion is possible though unlikely.

Effects of over exposure:

Acute: Skin contact may cause irritation, sensitization, and allergic reactions. Inhalation can cause mucous membrane irritation, chest tightening, coughing, headache, and shortness of breath. Eye contact can cause severe irritation. Ingestion can cause irritation and possible corrosive action on the mouth and stomach tissue. Vomiting may occur.

Chronic: Some individuals may develop sensitivity leading to asthma-like symptoms on subsequent exposures below the TLV. Excessive exposure can produce serious and possibly irreversible pulmonary injury.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water, get medical attention.

Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. If redness and irritation continue, call a physician.

Ingestion - get immediate medical attention. Dilute with milk or water. DO NOT INDUCE VOMITING.

Inhalation - remove to fresh air. Give oxygen if needed. Consult a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: personnel who will clean the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with federal, state, and local regulations.

Section VIII: Special Protection Information

tion to maintain airborne concentrations below TLV.
Protective Gloves: chemical resistant gloves should be worn.
Eye Protection; safety goggles should be worn.
Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials and moisture. Blanket partially used contents with nitrogen.
Other Precautions: do not transfer into unmarked containers.

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: DYNAFLEX 513
Product Code: 72306
Product Class: Prepolymer
Chemical Abstract Number: 9057-91-4

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 2 Protective Code: G

Threshold Limit Value (TLV):

No TLV has been established for this product. See section II.

Printed Date: 09/20/89

Revision Date: 07/21/86

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Toluene Diisocyanate (TDI)		<3	0.005	0.04 TWA	88'AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	
Xylene		<2	100	435	6.0
	1330-20-7		1988	AGCIH	
Mineral Spirits		<2	118	Suggestd	2.0

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: <4
Density (lb/gal): 8.8
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: COMBUSTIBLE LIQUID N.O.S. (CONTAINING PETROLEUM DISTILLATE)

Flash Point: 170

Extinguishing Media: Foam, carbon dioxide, dry chemical

Unusual fire and explosion hazards: keep the container tightly sealed
and away from heat, sparks and open flame.

Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended
to protect from products of combustion.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, alcohols, and amines.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of nitrogen and isocyanate vapors.

Hazardous Polymerization: may occur

Section VI: Health Hazard Data

Primary routes of entry: Inhalation, eyes, absorption by skin.
Ingestion is possible though unlikely.

Effects of over exposure:

Acute: Skin contact may cause irritation, sensitization, and allergic reactions. Inhalation can cause mucous membrane irritation, chest tightening, coughing, headache, and shortness of breath. Eye contact can cause severe irritation. Ingestion can cause irritation and possible corrosive action on the mouth and stomach tissue. Vomiting may occur.

Chronic: Some individuals may develop sensitivity leading to asthma-like symptoms on subsequent exposures below the TLV. Excessive exposure can produce serious and possibly irreversible pulmonary injury.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water, get medical attention.

Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. If redness and irritation continue, call a physician.

Ingestion - get immediate medical attention. Dilute with milk or water. DO NOT INDUCE VOMITING.

Inhalation - remove to fresh air. Give oxygen if needed. Consult a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: personnel who will clean the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbent. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with federal, state, and local regulations.

Section VIII: Special Protection Information

tion to maintain airborne concentrations below TLV.
Protective Gloves: chemical resistant gloves should be worn.
Eye Protection; safety goggles should be worn.
Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials and moisture. Blanket partially used contents with nitrogen.
Other Precautions: do not transfer into unmarked containers.

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2.04

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Dynaflex 403
Product Code: 72304
Product Class: Prepolymer
Chemical Abstract Number: 9057-91-4

HMIS/NFPA Hazard Identification System:

Health: 2* Reactivity: 1
Flammability: 1 Protective Code: G

Threshold Limit Value (TLV):

No TLV has been established for this product.

Printed Date: 09/20/89

Revision Date: 11/03/86

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Toluene Diisocyanate (TDI)		< 2	0.005	0.04 TWA	88'AGCIH
On NTP list and IARC Monograph 584-84-9			0.02	.15 STEL	
Isocyanate terminated polymers		< 98			
			none		

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 8.7
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Paint and related material.
Flash Point: 370 F

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Dynaflex 760
Product Code: 72308
Product Class: Prepolymer
Chemical Abstract Number: 9057-91-4

HMIS/NFPA Hazard Identification System:

Health: 2* Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):

No TLV has been established for this product.

Printed Date: 09/20/89

Revision Date: 11/03/86

Section II: Hazardous Ingredients

<u>Ingredient Name</u>	<u>Chemical Abstracts Number</u>	<u>Percent By Wght.</u>	<u>TLV (OSHA/ACGIH)</u>		<u>Vapor Pressure mm Hg @68</u>
			<u>PPM</u>	<u>Mg/M</u>	
Toluene Diisocyanate (TDI)		<1	0.005	0.04 TWA	88'ACGIH
On NTP list and IARC Monograph 584-84-9			0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: NIL
Density (lb/gal): 8.7
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Paint and related material.
Flash Point: 395 F

CasChem, Inc.
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2.05

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 128
Product Code: 72027
Product Class: Prepolymer
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/17/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Toluene Diisocyanate (TDI)		< 10	0.005	0.04 TWA	88'ACGIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 9.0
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Paint and related material.

Flash Point: 375 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical, halon 1211.

Special Fire Fighting Procedures/Unusual Fire or Explosion Hazards:

Full fire fighter protective clothing which leaves no skin surfaces exposed and self-contained breathing apparatus are to be used. Highly toxic vapors may be generated by thermal decomposition or combustion. Isocyanates, when reacted with water generate carbon dioxide gas. Hot isocyanate may react vigorously with water. When heated, sealed containers may rupture violently.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, amines and alcohols.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, HCN, NO_x and TDI vapors (see section VI)

Polymerization: may occur if in contact with water or other materials that react with isocyanates.

Section VI: Health Hazard Data

Effects of over exposure:

Acute:

Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, redding, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation and corrosive action in the mouth, stomach tissues, and digestive tract.

Chronic:

Inhalation: As a result of repeated overexposures or single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis.

Once a person is diagnosed as sensitized to TDI no further exposure can be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this material.

Carcinogenicity: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute).

* Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic" as determined by feeding studies on rodents fed with high oral doses. Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "there is inadequate evidence for the carcinogenicity of TDI to humans". In addition, a two year study has shown that TDI was not carcinogenic to rats.

Toxicology Data: TDI

Acute:

Oral, LD50.....: 5800 mg/kg (Rats)
Dermal, LD50.....: > 10 g/kg (Rabbits)
Inhalation, LC50....: 12.7 to 66 ppm for 1-4 hour (Rat)
Eye effects.....: strongly irritating (rabbits) OECD Guidelines
Skin effects.....: Corrosive to skin (rabbits) OECD guidelines.
Sensitization.....: Skin sensitizer in guinea pigs.

Chronic.....: Rats and mice exposed to 0.05 to 0.15 ppm TDI for two years resulted in irritation of the mucous membranes of the respiratory tract (International Isocyanate Institute). In lifetime inhalation studies conducted by Hazelton Labs for the International Isocyanate Institute, TDI did not demonstrate carcinogenic (cancer causing) activity in rats or mice.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes. Get medical attention
Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes. If irritation continues call a physician.
Ingestion - Do not induce vomiting. Get immediate medical attention.
Inhalation - remove to fresh air. Give oxygen if needed. If not breathing, give mouth to mouth resuscitation. Call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled:

Contain the spill. Personnel who will be engaged in cleaning up the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with 1-2% detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with State, Local and Federal regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during excess or unknown exposures.

Ventilation: work area is to be provided with proper exhaust ventilation to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: Water source should be available to wash skin or rinse eyes in case of inadvertant contamination.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 128 M2
Product Code: 72040
Product Class: Prepolymer
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 11/18/86

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Toluene Diisocyanate (TDI)		< 10	0.005	0.04 TWA	88'ACGIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 9.0
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Paint and related material.

Flash Point: 375 F

Extinguishing Media: Foam, carbon dioxide, dry chemical

Unusual fire and explosion hazards: keep the container tightly sealed
and away from heat, sparks and open flame.

Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended
to protect from products of combustion.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, alcohols, and amines.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of nitrogen and isocyanate vapors.

Hazardous Polymerization: may occur

Section VI: Health Hazard Data

Primary routes of entry: Inhalation, eyes, absorption by skin.
Ingestion is possible though unlikely.

Effects of over exposure:

Acute: Skin contact may cause irritation, sensitization, and allergic reactions. Inhalation can cause mucous membrane irritation, chest tightening, coughing, headache, and shortness of breath. Eye contact can cause severe irritation. Ingestion can cause irritation and possible corrosive action on the mouth and stomach tissue. Vomiting may occur.

Chronic: Some individuals may develop sensitivity leading to asthma-like symptoms on subsequent exposures below the TLV. Excessive exposure can produce serious and possibly irreversible pulmonary injury.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water, get medical attention.

Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. If redness and irritation continue, call a physician.

Ingestion - get immediate medical attention. Dilute with milk or water. DO NOT INDUCE VOMITING.

Inhalation - remove to fresh air. Give oxygen if needed. Consult a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: personnel who will clean the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with federal, state, and local regulations.

Section VIII: Special Protection Information

tion to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials and moisture. Blanket partially used contents with nitrogen.

Other Precautions: do not transfer into unmarked containers.

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 1727
Product Code: 72242
Product Class: Prepolymer
Chemical Abstract Number: Mixture

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 11/18/86

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Higher molecular weight polymers of similar structure.		< 45			
Methylene bisphenyl isocyanate or Diphenylmethan diisocyanate	101-68-8	< 45	0.02-TWA Ceiling	0.2--TWA limit	88'AGCIH
Toluene Diisocyanate (TDI)		< 3	0.005	0.04 TWA	88'AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 8.5
Appearance: Clear, colorless liquid.

Section IV: Fire and Explosion Hazard Data

D.O.T. Category:

Flash Point: > 350 F

Extinguishing Media: Foam, carbon dioxide, dry chemical

Unusual fire and explosion hazards: keep the container tightly sealed and away from heat, sparks and open flame.

Special Fire Fighting Procedures: standard fireman's body protection should be worn. Self-contained breathing apparatus is recommended to protect from products of combustion.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, alcohols, and amines.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of nitrogen and isocyanate vapors.

Hazardous Polymerization: may occur

Section VI: Health Hazard Data

Primary routes of entry: Inhalation, eyes, absorption by skin.
Ingestion is possible though unlikely.

Effects of over exposure:

Acute: Skin contact may cause irritation, sensitization, and allergic reactions. Inhalation can cause mucous membrane irritation, chest tightening, coughing, headache, and shortness of breath. Eye contact can cause severe irritation. Ingestion can cause irritation and possible corrosive action on the mouth and stomach tissue. Vomiting may occur.

Chronic: Some individuals may develop sensitivity leading to asthma-like symptoms on subsequent exposures below the TLV. Excessive exposure can produce serious and possibly irreversible pulmonary injury.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water, get medical attention.

Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. If redness and irritation continue, call a physician.

Ingestion - get immediate medical attention. Dilute with milk or water. DO NOT INDUCE VOMITING.

Inhalation - remove to fresh air. Give oxygen if needed. Consult a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: personnel who will clean the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with federal, state, and local regulations.

Section VIII: Special Protection Information

tion to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials and moisture. Blanket partially used contents with nitrogen.

Other Precautions: do not transfer into unmarked containers.

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 174
Product Code: 72257
Product Class: Prepolymer
Chemical Abstract Number: Mixture

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 2
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/30/89

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methyl Isobutyl Ketone	108-10-1	< 15	100	410	15.0
Toluene (Toluol)			50	205	
	108-88-3	< 15	100	375	(TWA)
			1988	AGCIH	
Toluene Diisocyanate (TDI)	584-84-9	< 7	0.005	0.04 TWA	88'AGCIH
On NTP list and IARC Monograph			0.02	.15 STEL	

Section III: Physical Data

Boiling Range: Not determ
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: < 30
Density (lb/gal): 8.4
Appearance: Clear, yellowish liquid with sweet odor.

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Flammable liquid NOS (Contains Toluene) (PAINT AND RELA
Flash Point: 89 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical, halon 1211.

Special Fire Fighting Procedures/Unusual Fire or Explosion Hazards:

Full fire fighter protective clothing which leaves no skin surfaces exposed and self-contained breathing apparatus are to be used. Highly toxic vapors may be generated by thermal decomposition or combustion. Isocyanates, when reacted with water generate carbon dioxide gas. Hot isocyanate may react vigorously with water. When heated, sealed containers may rupture violently or explode.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, amines and alcohols.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, HCN, NO_x and TDI vapors (see section VI)

Polymerization: may occur.
that react with isocyanates.

Section VI: Health Hazard Data

Effects of over exposure:

Acute:

Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, redding, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation and corrosive action in the mouth, stomach tissues, and digestive tract.

Chronic:

Inhalation: As a result of repeated overexposures or single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis.

Once a person is diagnosed as sensitized to TDI no further exposure can be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this material.

Carcinogenicity: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute).

* Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic" as determined by feeding studies on rodents fed with high oral doses. Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "there is inadequate evidence for the carcinogenicity of TDI to humans". In addition, a two year study has shown that TDI was not carcinogenic to rats.

Toxicology Data: TDI

Acute:

Oral, LD50.....: 5800 mg/kg (Rats)
Dermal, LD50.....: > 10 g/kg (Rabbits)
Inhalation, LC50....: 12.7 to 66 ppm for 1-4 hour (Rat)
Eye effects.....: strongly irritating (rabbits) OECD Guidelines
Skin effects.....: Corrosive to skin (rabbits) OECD guidelines.
Sensitization.....: Skin sensitizer in guinea pigs.

Chronic.....: Rats and mice exposed to 0.05 to 0.15 ppm TDI for two years resulted in irritation of the mucous membranes of the respiratory tract (International Isocyanate Institute). In lifetime inhalation studies conducted by Hazelton Labs for the International Isocyanate Institute, TDI did not demonstrate carcinogenic (cancer causing) activity in rats or mice.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes. Get medical attention
Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes. If irritation continues call a physician.
Ingestion - Do not induce vomiting. Get immediate medical attention.
Inhalation - remove to fresh air. Give oxygen if needed. If not breathing, give mouth to mouth resuscitation. Call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled:

Remove sources of ignition!
Contain the spill. Personnel who will be engaged in cleaning up the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with 1-2% detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with State, Local and Federal regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during excess or unknown exposures.

Ventilation: work area is to be provided with proper exhaust ventilation to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: Water source should be available to wash skin or rinse eyes in case of inadvertant contamination.

containers. Protect from contamination with foreign materials and moisture. Ground containers before transferring contents.
Other Precautions: do not transfer into unmarked containers.

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2.09

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 1742
Product Code: 72292
Product Class: Prepolymer
Chemical Abstract Number: 67700-43-0

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/17/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methylene bisphenyl isocyanate or Diphenylmethan diisocyanate	101-68-8	< 40	0.02-TWA Ceiling	0.2--TWA limit	88'AGCIH
Toluene Diisocyanate (TDI)		< 1	0.005	0.04 TWA	88'AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 8.9
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: ISOCYANATES AND SOLUTIONS, N.O.S. (PKG GRP II) POISON
Flash Point: 395 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical, halon 1211.

Special Fire Fighting Procedures/Unusual Fire or Explosion Hazards:

Full fire fighter protective clothing which leaves no skin surfaces exposed and self-contained breathing apparatus are to be used. Highly toxic vapors may be generated by thermal decomposition or combustion. Isocyanates, when reacted with water generate carbon dioxide gas. Hot isocyanate may react vigorously with water. When heated, sealed containers may rupture violently.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, amines and alcohols.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, HCN, NO_x and TDI vapors (see section VI)

Polymerization: may occur if in contact with water or other materials that react with isocyanates.

Section VI: Health Hazard Data

Effects of over exposure:

Acute:

Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, redding, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation and corrosive action in the mouth, stomach tissues, and digestive tract.

Chronic:

Inhalation: As a result of repeated overexposures or single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis.

Once a person is diagnosed as sensitized to TDI no further exposure can be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this material.

Carcinogenicity: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute).

* Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic" as determined by feeding studies on rodents fed with high oral doses. Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "there is inadequate evidence for the carcinogenicity of TDI to humans". In addition, a two year study has shown that TDI was not carcinogenic to rats.

Toxicology Data: TDI

Acute:

Oral, LD50.....: 5800 mg/kg (Rats)
Dermal, LD50.....: > 10 g/kg (Rabbits)
Inhalation, LC50....: 12.7 to 66 ppm for 1-4 hour (Rat)
Eye effects.....: strongly irritating (rabbits) OECD Guidelines
Skin effects.....: Corrosive to skin (rabbits) OECD guidelines.
Sensitization.....: Skin sensitizer in guinea pigs.

Chronic.....: Rats and mice exposed to 0.05 to 0.15 ppm TDI for two years resulted in irritation of the mucous membranes of the respiratory tract (International Isocyanate Institute). In lifetime inhalation studies conducted by Hazelton Labs for the International Isocyanate Institute, TDI did not demonstrate carcinogenic (cancer causing) activity in rats or mice.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes. Get medical attention
Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes. If irritation continues call a physician.
Ingestion - Do not induce vomiting. Get immediate medical attention.
Inhalation - remove to fresh air. Give oxygen if needed. If not breathing, give mouth to mouth resuscitation. Call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled:

Contain the spill. Personnel who will be engaged in cleaning up the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with 1-2% detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with State, Local and Federal regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during excess or unknown exposures.

Ventilation: work area is to be provided with proper exhaust ventilation to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: Water source should be available to wash skin or rinse eyes in case of inadvertant contamination.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 1748 M1
Product Code: 72241
Product Class: Adhesive
Chemical Abstract Number: Mixture

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 3 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 11/18/86

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Toluene Diisocyanate (TDI)		< 30	0.005	0.04 TWA	88' AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	
Methyl ethyl ketone		< 30	200 TWA	590 TWA	71.2
	78-93-3		1988	AGCIH	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: < 30
Density (lb/gal): 8.1
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category:

Flash Point: 20 deg F

Extinguishing Media: foam, carbon dioxide, dry chemical.

Unusual fire and explosion hazards: keep container closed. Isolate from heat, electrical sparks and open flame. Closed containers may explode when exposed to extreme heat.

Special Fire Fighting Procedures: standard fireman's body protection should be worn. Self-contained breathing apparatus is recommended to protect from product of combustion.

Section V: Reactivity Data

Stability: Stable

Conditions to avoid: heat, sparks and open flame.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of Nitrogen, and dense smoke.

Hazardous Polymerization: Will not occur.

Section VI: Health Hazard Data

Effects of over exposure: Inhalation may cause headache, shortness of breath, nausea, dizziness, and mucous membrane irritation.

Prolonged skin contact may result in systemic illness, and can cause irritation and possible allergic reactions.

Eye contact can cause severe irritation and possible corneal damage.

Emergency and First Aid Procedures:

Eyes....flush thoroughly with water, get medical attention.

Skin....wash thoroughly with soap and water. If a rash develops, see a physician.

Ingestion....call a physician as soon as possible.

Inhalation....remove to fresh air. Give oxygen if necessary. call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: remove all sources of ignition. Evacuate personnel. Only properly equipped personnel with respiratory and eye protection should remain. Spill should be covered with vermiculite, sawdust or other absorbant. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with Federal, State, and Local Regulations.

Section VII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved face mask with an organic vapor cartridge or a self-contained breathing apparatus is to be provided.

Ventilation: Good mechanical ventilation is required to keep TLV (Section II) components at an acceptable level.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection: safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials.

Other Precautions: do not trnsfer into unmarked drums. Containers

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 1754
Product Code: 72214
Product Class: Prepolymer
Chemical Abstract Number: 67700-43-0**

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 1 Protective Code: B
Threshold Limit Value (TLV):
** Additional CAS #'s: 68459-77-8; 70024-98-5
Printed Date: 09/20/89 Revision Date: 10/22/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68 1x10 E-3
			PPM	Mg/M	
Methylene bis (4-cyclohexyl- isocyanate)	822-06-0	< 70	0.01	0.11	
Toluene Diisocyanate (TDI)		< 1	0.005	0.04 TWA	88' ACGIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range:
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 8.9
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category:
Flash Point: 395 deg F (PMCC)
Extinguishing Media: foam, carbon dioxide, dry chemical
Unusual fire and explosion hazards: keep the container tightly sealed
and away from heat, sparks and open flame.

Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended
to protect from products of combustion.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, alcohols, and amines.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, TDI, oxides of nitrogen and isocyanate vapors.

Polymerization: may occur

Section VI: Health Hazard Data

Effects of over exposure:

Acute: Skin contact may cause irritation or sensitization.

Inhalation can cause mucous membrane irritation.

Eye contact can cause severe irritation.

Chronic: Some individuals may develop sensitivity leading to asthma-like symptoms on subsequent exposures below the TLV.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes, get medical attention.

Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. If redness and irritation continue, call a physician.

Ingestion - get immediate medical attention.

Inhalation - remove to fresh air. Give oxygen if needed. Consult a physician.

Toxicity Data:

Dermal Corrosivity: Not considered corrosive to the skin of rabbits.

Skin Absorption: Under conditions of study, Vorite 1754 failed to produce mortality and is not considered toxic by skin absorption as defined in 49CFR Part 173.343.

Acute Oral Toxicity: At dose levels of 50 mg/kg of body weight, all animals tested survived the 48 hour post administration observation period. Therefore Vorite 1754 is not considered an oral toxin as described in 49CFR Part 173.343.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: personnel who will clean the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with federal, state, and local regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during

Eye Protection; safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials and moisture. Blanket partially used contents with nitrogen.

Other Precautions: do not transfer into unmarked containers.

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 1787
Product Code: 72050
Product Class: Adhesive
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 3 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/19/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methyl ethyl ketone	78-93-3	< 40	200 TWA 1988 AGCIH	590 TWA	71.2
Toluene Diisocyanate (TDI)		< 1	0.005	0.04 TWA	88' AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range:
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: < 40
Density (lb/gal): 8.0
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Flammable liquid N.O.S (Contains MEK) UN #1993

Flash Point: 35 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical.

Unusual fire and explosion hazards: keep container closed. Isolate from heat, electrical sparks and open flame. Closed containers may explode when exposed to extreme heat.

Special Fire Fighting Procedures: standard fireman's body protection should be worn. Self-contained breathing apparatus is recommended to protect from product of combustion.

Section V: Reactivity Data

Stability: Stable

Conditions to avoid: heat, sparks and open flame.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of Nitrogen, and dense smoke.

Hazardous Polymerization: Will not occur.

Section VI: Health Hazard Data

Effects of over exposure: Inhalation may cause headache, shortness of breath, nausea, dizziness, and mucous membrane irritation.

Prolonged skin contact may result in systemic illness, and can cause irritation and possible allergic reactions.

Eye contact can cause severe irritation and possible corneal damage.

Emergency and First Aid Procedures:

Eyes....flush thoroughly with water, get medical attention.

Skin....wash thoroughly with soap and water. If a rash develops, see a physician.

Ingestion....call a physician as soon as possible.

Inhalation....remove to fresh air. Give oxygen if necessary. call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: remove all sources of ignition. Evacuate personnel. Only properly equipped personnel with respiratory and eye protection should remain. Spill should be covered with vermiculite, sawdust or other absorbant. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with Federal, State, and Local Regulations.

Section VII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved face mask with an organic vapor cartridge or a self-contained breathing apparatus is to be provided.

Ventilation: Good mechanical ventilation is required to keep TLV (Section II) components at an acceptable level.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection: safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials.

Other Precautions: do not trnsfer into unmarked drums. Containers

Section V: Reactivity Data

Stability: Stable

Conditions to avoid: heat, sparks and open flame.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of Nitrogen, and dense smoke.

Hazardous Polymerization: Will not occur.

Section VI: Health Hazard Data

Effects of over exposure: Inhalation may cause headache, shortness of breath, nausea, dizziness, and mucous membrane irritation.

Prolonged skin contact may result in systemic illness, and can cause irritation and possible allergic reactions.

Eye contact can cause severe irritation and possible corneal damage.

Emergency and First Aid Procedures:

Eyes....flush thoroughly with water, get medical attention.

Skin....wash thoroughly with soap and water. If a rash develops, see a physician.

Ingestion....call a physician as soon as possible.

Inhalation....remove to fresh air. Give oxygen if necessary. call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: remove all sources of ignition. Evacuate personnel. Only properly equipped personnel with respiratory and eye protection should remain. Spill should be covered with vermiculite, sawdust or other absorbant. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with Federal, State, and Local Regulations.

Section VII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved face mask with an organic vapor cartridge or a self-contained breathing apparatus is to be provided.

Ventilation: Good mechanical ventilation is required to keep TLV (Section II) components at an acceptable level.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection: safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials.

Other Precautions: do not transfer into unmarked drums. Containers

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 1788 M1
Product Code: 72054
Product Class: Adhesive
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 0 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/24/88

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
1,1,1, Trichloroethane or Methyl Chloroform	71-55-6	< 60	350	1900 TWA 1988 AGCIH	
Toluene Diisocyanate (TDI) On NTP list and IARC Monograph	584-84-9	< 1	0.005 0.02	0.04 TWA .15 STEL	88' AGCIH
Diethylene Ether	123-91-1	< 2			

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: < 60
Density (lb/gal): 9.9
Appearance: Clear, yellow-amber liquid.

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Paint and related material.
Flash Point: N/A

Extinguishing Media: foam, carbon dioxide, dry chemical, halon 1211.

Special Fire Fighting Procedures/Unusual Fire or Explosion Hazards:

Full fire fighter protective clothing which leaves no skin surfaces exposed and self-contained breathing apparatus are to be used. Highly toxic vapors may be generated by thermal decomposition or combustion. Isocyanates, when reacted with water generate carbon dioxide gas. Hot isocyanate may react vigorously with water. When heated, sealed containers may rupture violently or explode.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, amines and alcohols. Also, avoid contact with Potassium and Aluminum.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, HCN, NO_x and TDI vapors (see section VI).

Aluminum may react with Trichloroethane which evolves Hydrogen gas.

Polymerization: may occur if in contact with water or other materials that react with isocyanates.

Section VI: Health Hazard Information

Effects of over exposure:

Acute:

Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, redding, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation and corrosive action in the mouth, stomach tissues, and digestive tract.

If ingested, 1,1,1-trichloroethane is rapidly absorbed through the lungs and may injure other body systems. High levels of vapor e.g. 10,000 ppm may cause irregular heart beat (cardiac arrhythmias).

Chronic:

Inhalation: As a result of repeated overexposures or single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis.

Once a person is diagnosed as sensitized to TDI no further exposure can be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this material.

Carcinogenicity: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute).

Section VI: Health Hazard Information (cont)

* Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic" as determined by feeding studies on rodents fed with high oral doses. Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "there is inadequate evidence for the carcinogenicity of TDI to humans". In addition, a two year study has shown that TDI was not carcinogenic to rats.

Toxicology Data: TDI

Acute:

Oral, LD50.....: 5800 mg/kg (Rats)
Dermal, LD50.....: > 10 g/kg (Rabbits)
Inhalation, LC50....: 12.7 to 66 ppm for 1-4 hours (rat)
Eye effects.....: strongly irritating (rabbits) OECD Guidelines
Skin effects.....: Corrosive to skin (rabbits) OECD guidelines.
Sensitization.....: Skin sensitizer in guinea pigs.

Chronic.....: Rats and mice exposed to 0.05 to 0.15 ppm TDI for two years resulted in irritation of the mucous membranes of the respiratory tract (International Isocyanate Institute). In lifetime inhalation studies conducted by Hazelton Labs for the International Isocyanate Institute, TDI did not demonstrate carcinogenic (cancer causing) activity in rats or mice.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes. Get medical attention
Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes. If irritation continues call a physician.
Ingestion - Do not induce vomiting. Get immediate medical attention.
Inhalation - remove to fresh air. Give oxygen if needed. If not breathing, give mouth to mouth resuscitation. Call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled:

Contain the spill. Personnel who will be engaged in cleaning up the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with an absorbant material. Absorbed material should be placed in open containers and treated with water for 24 hours before sealing and disposing. Spill area can be washed with 1-2% detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with State, Local and Federal regulations.

Section VIII: Special Protection Information

Respiratory Protection: At exposure levels at or near the TLV (section II) a NIOSH/MSHA organic vapor respirator with FRESH CARTRIDGES may be used for up to an hour. At greater or unknown levels, self contained breathing apparatus must be used.

Ventilation: work area is to be provided with proper exhaust ventilation to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection: safety goggles should be worn.

Other Protective Equipment: Water source should be available to wash skin or rinse eyes in case of inadvertant contamination.

Section IX: Additional Precautions and Information

Precautions to be taken in handling and storing: Store in closed containers. Protect from contamination with foreign materials and moisture. Blanket partially used contents with nitrogen. Avoid contact with aluminum.

Other Precautions: do not transfer into unmarked containers.

CasChem, Inc.
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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 1791
Product Code: 90113
Product Class: Prepolymer
Chemical Abstract Number: 67700-43-0**

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 1 Protective Code: B

Threshold Limit Value (TLV):

** Additional CAS #'s: 68459-77-8; 70024-98-5

Printed Date: 09/20/89

Revision Date: 10/22/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68 1x10 E-3
			PPM	Mg/M	
Methylene bis (4-cyclohexyl- isocyanate)	822-06-0	< 55	0.01	0.11	
Toluene Diisocyanate (TDI)		< 1	0.005	0.04 TWA	88' ACGIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 8.9
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category:

Flash Point: > 375 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical

Unusual fire and explosion hazards: keep the container tightly sealed
and away from heat, sparks and open flame.

Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended
to protect from products of combustion.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, alcohols, and amines.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, TDI, oxides of nitrogen and isocyanate vapors.

Polymerization: may occur

Section VI: Health Hazard Data

Effects of over exposure:

Acute: Skin contact may cause irritation or sensitization.

Inhalation can cause mucous membrane irritation.

Eye contact can cause severe irritation.

Chronic: Some individuals may develop sensitivity leading to asthma-like symptoms on subsequent exposures below the TLV.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes, get medical attention.

Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. If redness and irritation continue, call a physician.

Ingestion - get immediate medical attention.

Inhalation - remove to fresh air. Give oxygen if needed. Consult a physician.

Toxicity Data:

Dermal Corrosivity: Not considered corrosive to the skin of rabbits.

Skin Absorption: Under conditions of study, Vorite 1754 failed to produce mortality and is not considered toxic by skin absorption as defined in 49CFR Part 173.343.

Acute Oral Toxicity: At dose levels of 50 mg/kg of body weight, all animals tested survived the 48 hour post administration observation period. Therefore Vorite 1754 is not considered an oral toxin as described in 49CFR Part 173.343.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: personnel who will clean the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with federal, state, and local regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during

Eye Protection; safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials and moisture. Blanket partially used contents with nitrogen.

Other Precautions: do not transfer into unmarked containers.

CasChem, Inc.
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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 612
Product Code: 72031
Product Class: Prepolymer
Chemical Abstract Number: 68592-25-0

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/17/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methylene bisphenyl isocyanate or Diphenylmethan diisocyanate	101-68-8	< 20	0.02-TWA Ceiling	0.2--TWA limit	88'AGCIH
Higher molecular weight poly- mers of similar structure.		< 20			
Toluene Diisocyanate (TDI)		< 3	0.005	0.04 TWA	88'AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 9.3
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Paint and related material.

Flash Point: 385 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical, halon 1211.

Special Fire Fighting Procedures/Unusual Fire or Explosion Hazards:

Full fire fighter protective clothing which leaves no skin surfaces exposed and self-contained breathing apparatus are to be used. Highly toxic vapors may be generated by thermal decomposition or combustion. Isocyanates, when reacted with water generate carbon dioxide gas. Hot isocyanate may react vigorously with water. When heated, sealed containers may rupture violently.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, amines and alcohols.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, HCN, NO_x and TDI vapors (see section VI)

Polymerization: may occur if in contact with water or other materials that react with isocyanates.

Section VI: Health Hazard Data

Effects of over exposure:

Acute:

Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, redding, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation and corrosive action in the mouth, stomach tissues, and digestive tract.

Chronic:

Inhalation: As a result of repeated overexposures or single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis.

Once a person is diagnosed as sensitized to TDI no further exposure can be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this material.

Carcinogenicity: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute).

* Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic" as determined by feeding studies on rodents fed with high oral doses. Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "there is inadequate evidence for the carcinogenicity of TDI to humans". In addition, a two year study has shown that TDI was not carcinogenic to rats.

Toxicology Data: TDI

Acute:

Oral, LD50.....: 5800 mg/kg (Rats)
Dermal, LD50.....: > 10 g/kg (Rabbits)
Inhalation, LC50....: 12.7 to 66 ppm for 1-4 hour (Rat)
Eye effects.....: strongly irritating (rabbits) OECD Guidelines
Skin effects.....: Corrosive to skin (rabbits) OECD guidelines.
Sensitization.....: Skin sensitizer in guinea pigs.

Chronic.....: Rats and mice exposed to 0.05 to 0.15 ppm TDI for two years resulted in irritation of the mucous membranes of the respiratory tract (International Isocyanate Institute). In lifetime inhalation studies conducted by Hazelton Labs for the International Isocyanate Institute, TDI did not demonstrate carcinogenic (cancer causing) activity in rats or mice.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes. Get medical attention
Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes. If irritation continues call a physician.
Ingestion - Do not induce vomiting. Get immediate medical attention.
Inhalation - remove to fresh air. Give oxygen if needed. If not breathing, give mouth to mouth resuscitation. Call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled:

Contain the spill. Personnel who will be engaged in cleaning up the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with 1-2% detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with State, Local and Federal regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during excess or unknown exposures.

Ventilation: work area is to be provided with proper exhaust ventilation to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: Water source should be available to wash skin or rinse eyes in case of inadvertant contamination.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed

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CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 612-M2
Product Code: 72033
Product Class: Prepolymer
Chemical Abstract Number: 68952-25-0

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/17/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methylene bisphenyl isocyanate or Diphenylmethan diisocyanate	101-68-8	< 20	0.02-TWA Ceiling	0.2--TWA limit	88'AGCIH
Higher molecular weight poly- mers of similar structure.		< 20			
Toluene Diisocyanate (TDI)		< 3	0.005	0.04 TWA	88'AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 9.3
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Not Regulated
Flash Point: 385 deg F (PMCC)
Extinguishing Media: foam, carbon dioxide, dry chemical, halon 1211.
Special Fire Fighting Procedures/Unusual Fire or Explosion Hazards:
Full fire fighter protective clothing which leaves no skin surfaces
exposed and self-contained breathing apparatus are to be used. High-
ly toxic vapors may be generated by thermal decomposition or combust-
ion. Isocyanates, when reacted with water generate carbon dioxide
gas. Hot isocyanate may react vigorously with water. When heated,
sealed containers may rupture violently.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, amines and alcohols.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, HCN, NO_x and TDI vapors (see section VI)

Polymerization: may occur if in contact with water or other materials that react with isocyanates.

Section VI: Health Hazard Data

Effects of over exposure:

Acute:

Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, reddening, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation and corrosive action in the mouth, stomach tissues, and digestive tract.

Chronic:

Inhalation: As a result of repeated overexposures or single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis.

Once a person is diagnosed as sensitized to TDI no further exposure can be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this material.

Carcinogenicity: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute).

* Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic" as determined by feeding studies on rodents fed with high oral doses. Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "there is inadequate evidence for the carcinogenicity of TDI to humans". In addition, a two year study has shown that TDI was not carcinogenic to rats.

Toxicology Data: TDI

Acute:

Oral, LD50.....: 5800 mg/kg (Rats)
Dermal, LD50.....: > 10 g/kg (Rabbits)
Inhalation, LC50....: 12.7 to 66 ppm for 1-4 hour (Rat)
Eye effects.....: strongly irritating (rabbits) OECD Guidelines
Skin effects.....: Corrosive to skin (rabbits) OECD guidelines.
Sensitization.....: Skin sensitizer in guinea pigs.

Chronic.....: Rats and mice exposed to 0.05 to 0.15 ppm TDI for two years resulted in irritation of the mucous membranes of the respiratory tract (International Isocyanate Institute). In lifetime inhalation studies conducted by Hazelton Labs for the International Isocyanate Institute, TDI did not demonstrate carcinogenic (cancer causing) activity in rats or mice.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes. Get medical attention
Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes. If irritation continues call a physician.
Ingestion - Do not induce vomiting. Get immediate medical attention.
Inhalation - remove to fresh air. Give oxygen if needed. If not breathing, give mouth to mouth resuscitation. Call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled:

Contain the spill. Personnel who will be engaged in cleaning up the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with 1-2% detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with State, Local and Federal regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during excess or unknown exposures.

Ventilation: work area is to be provided with proper exhaust ventilation to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: Water source should be available to wash skin or rinse eyes in case of inadvertant contamination.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 63
Product Code: 72026
Product Class: Prepolymer
Chemical Abstract Number: 70955-23-6

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/17/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Toluene Diisocyanate (TDI)		< 14	0.005	0.04 TWA	88' ACGIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 9.2
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Paint and related material.

Flash Point: 310 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical, halon 1211.

Special Fire Fighting Procedures/Unusual Fire or Explosion Hazards:

Full fire fighter protective clothing which leaves no skin surfaces exposed and self-contained breathing apparatus are to be used. Highly toxic vapors may be generated by thermal decomposition or combustion. Isocyanates, when reacted with water generate carbon dioxide gas. Hot isocyanate may react vigorously with water. When heated, sealed containers may rupture violently.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, amines and alcohols.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, HCN, NO_x and TDI vapors (see section VI)

Polymerization: may occur if in contact with water or other materials that react with isocyanates.

Section VI: Health Hazard Data

Effects of over exposure:

Acute:

Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, reddening, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation and corrosive action in the mouth, stomach tissues, and digestive tract.

Chronic:

Inhalation: As a result of repeated overexposures or single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis.

Once a person is diagnosed as sensitized to TDI no further exposure can be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this material.

Carcinogenicity: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute).

* Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic" as determined by feeding studies on rodents fed with high oral doses. Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "there is inadequate evidence for the carcinogenicity of TDI to humans". In addition, a two year study has shown that TDI was not carcinogenic to rats.

Toxicology Data: TDI

Acute:

Oral, LD50.....: 5800 mg/kg (Rats)
Dermal, LD50.....: > 10 g/kg (Rabbits)
Inhalation, LC50....: 12.7 to 66 ppm for 1-4 hour (Rat)
Eye effects.....: strongly irritating (rabbits) OECD Guidelines
Skin effects.....: Corrosive to skin (rabbits) OECD guidelines.
Sensitization.....: Skin sensitizer in guinea pigs.

Chronic.....: Rats and mice exposed to 0.05 to 0.15 ppm TDI for two years resulted in irritation of the mucous membranes of the respiratory tract (International Isocyanate Institute). In lifetime inhalation studies conducted by Hazelton Labs for the International Isocyanate Institute, TDI did not demonstrate carcinogenic (cancer causing) activity in rats or mice.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes. Get medical attention
Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes. If irritation continues call a physician.
Ingestion - Do not induce vomiting. Get immediate medical attention.
Inhalation - remove to fresh air. Give oxygen if needed. If not breathing, give mouth to mouth resuscitation. Call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled:

Contain the spill. Personnel who will be engaged in cleaning up the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with 1-2% detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with State, Local and Federal regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during excess or unknown exposures.

Ventilation: work area is to be provided with proper exhaust ventilation to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: Water source should be available to wash skin or rinse eyes in case of inadvertant contamination.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 677 M-5
Product Code: 72035
Product Class: Adhesive
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 3 Reactivity: 1
Flammability: 3 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 01/12/88

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methyl ethyl ketone	78-93-3	< 30	200 TWA 1988 AGCIH	590 TWA	71.2
Toluene Diisocyanate (TDI)		< 0.5	0.005	0.04 TWA	88' AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: Not avail.
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: < 27
Density (lb/gal): 8.2
Appearance: Green, opaque, viscous liquid.

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Flammable liquid N.O.S (Contains MEK) UN #1993

Flash Point: 35 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical.

Unusual Fire and Explosion Hazards: Closed containers may explode
when exposed to extreme heat. Avoid contact with sparks and open
flame.

Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended to
protect from product of combustion. Keep containers cool with water
spray to avoid rupture. Inhalation of decomposition products can
cause irreversible pulmonary damage.

Section V: Reactivity Data

Stability: Stable

Conditions to avoid: heat, sparks and open flame.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of Nitrogen, and TDI vapors.

Polymerization: May occur if in contact with oxidizing agents, water, amines, and alcohols.

Section VI: Health Hazard Data

Effects of Overexposure:

Acute: Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath, and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, reddening, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation or corrosive action to the mouth, stomach tissues, and digestive tract.

Chronic: Inhalation - As a result of repeated overexposures or a single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis. Once diagnosed as sensitized to TDI, no further exposure should be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this product.

Carcinogenicity: No carcinogenic activity was observed in lifetime studies in rats and mice (International Isocyanate Institute).

Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic". Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "There is inadequate evidence for the carcinogenicity of TDI to humans" but "sufficient evidence for its carcinogenicity to experimental animals".

Toxicology Data: No available data on this product.

Emergency and First Aid Procedures:

Eyes....flush thoroughly with water for 15 minutes. Continue flushing if irritation continues. Consult a physician.
Skin....wash thoroughly with soap and water. If a rash develops, see a physician.
Ingestion....consult a physician or poison control center as soon as possible.
Inhalation....remove to fresh air. Give oxygen if necessary. Consult a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: remove all sources of ignition. Evacuate personnel. Only properly equipped personnel with respiratory and eye protection should remain. Spill should be covered with vermiculite, sawdust or other absorbant and transfered into an open container and treated for 24 hours before disposal. Spill area can be washed with 1-2 % detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with Federal, State, and Local Regulations.

Section VII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved face mask with fresh cartridges may be use for up to an hour during exposures near or at the TLV since TDI has poor warning properties. At exposures above the TLV, self contained breathing apparatus should be used.

Ventilation: Good mechanical ventilation is required to keep the TLV of the components (Section II) at an acceptable level.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection: safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials.

Other Precautions: do not transfer into unmarked drums. Bulk containers must be grounded before opening and pouring. Store in a cool, dry place.

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

Material Safety Data Sheet

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Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 677 M-8
Product Code: 72874
Product Class: Prepolymer
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 3 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 02/17/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methyl ethyl ketone	78-93-3	< 30	200 TWA 1988	590 TWA AGCIH	71.2
Toluene Diisocyanate (TDI)		< 1	0.005	0.04 TWA	88' AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: < 30
Density (lb/gal): 8.2
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: FLAMMABLE LIQUID N.O.S. (CONTAINING M.E.K.) (PAINT AND RELA
Flash Point: 55 deg F (PMCC)
Extinguishing Media: foam, carbon dioxide, dry chemical.
Unusual fire and explosion hazards: keep container closed. Isolate
from heat, electrical sparks and open flame. Closed containers may
explode when exposed to extreme heat.
Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended to
protect from product of combustion.

Section V: Reactivity Data

Stability: Stable

Conditions to avoid: heat, sparks and open flame.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of Nitrogen, and dense smoke.

Hazardous Polymerization: Will not occur.

Section VI: Health Hazard Data

Effects of over exposure: Inhalation may cause headache, shortness of breath, nausea, dizziness, and mucous membrane irritation.

Prolonged skin contact may result in systemic illness, and can cause irritation and possible allergic reactions.

Eye contact can cause severe irritation and possible corneal damage.

Emergency and First Aid Procedures:

Eyes....flush thoroughly with water, get medical attention.

Skin....wash thoroughly with soap and water. If a rash develops, see a physician.

Ingestion....call a physician as soon as possible.

Inhalation....remove to fresh air. Give oxygen if necessary. call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: remove all sources of ignition. Evacuate personnel. Only properly equipped personnel with respiratory and eye protection should remain. Spill should be covered with vermiculite, sawdust or other absorbant. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with Federal, State, and Local Regulations.

Section VII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved face mask with an organic vapor cartridge or a self-contained breathing apparatus is to be provided.

Ventilation: Good mechanical ventilation is required to keep TLV (Section II) components at an acceptable level.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection: safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials.

Other Precautions: do not transfer into unmarked drums. Containers

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

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Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 677 M11
Product Code: 90167
Product Class: Prepolymer
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 3 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 09/26/88

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methyl ethyl ketone	78-93-3	< 30	200 TWA	590 TWA	71.2
			1988	AGCIH	
Toluene Diisocyanate (TDI)	584-84-9	< 1	0.005	0.04 TWA	88'AGCIH
On NTP list and IARC Monograph			0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: < 30
Density (lb/gal): 8.2
Appearance: Clear, gold liquid.

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: FLAMMABLE LIQUID N.O.S. (CONTAINING M.E.K.) (PAINT AND RELA
Flash Point: 55 deg F (PMCC)
Extinguishing Media: foam, carbon dioxide, dry chemical.
Unusual fire and explosion hazards: keep container closed. Isolate
from heat, electrical sparks and open flame. Closed containers may
explode when exposed to extreme heat.
Special Fire Fighting Procedures: standard fireman's body protection
should be worn. Self-contained breathing apparatus is recommended to
protect from product of combustion.

Section V: Reactivity Data

Stability: Stable

Conditions to avoid: heat, sparks and open flame.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of Nitrogen, and dense smoke.

Hazardous Polymerization: Will not occur.

Section VI: Health Hazard Data

Effects of over exposure: Inhalation may cause headache, shortness of breath, nausea, dizziness, and mucous membrane irritation.

Prolonged skin contact may result in systemic illness, and can cause irritation and possible allergic reactions.

Eye contact can cause severe irritation and possible corneal damage.

Emergency and First Aid Procedures:

Eyes....flush thoroughly with water, get medical attention.

Skin....wash thoroughly with soap and water. If a rash develops, see a physician.

Ingestion....call a physician as soon as possible.

Inhalation....remove to fresh air. Give oxygen if necessary. call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: remove all sources of ignition. Evacuate personnel. Only properly equipped personnel with respiratory and eye protection should remain. Spill should be covered with vermiculite, sawdust or other absorbant. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with Federal, State, and Local Regulations.

Section VII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved face mask with an organic vapor cartridge or a self-contained breathing apparatus is to be provided.

Ventilation: Good mechanical ventilation is required to keep TLV (Section II) components at an acceptable level.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection: safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials.

Other Precautions: do not transfer into unmarked drums. Containers

2.22

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 677 M3
Product Code: 72034
Product Class: Prepolymer
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 3 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 08/19/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical Abstracts Number	Percent By Wght.	TLV (OSHA/ACGIH)		Vapor Pressure mm Hg @68
			PPM	Mg/M	
Methyl ethyl ketone	78-93-3	< 30	200 TWA 1988 AGCIH	590 TWA	71.2
Toluene Diisocyanate (TDI)		< 1	0.005	0.04 TWA	88' AGCIH
On NTP list and IARC Monograph	584-84-9		0.02	.15 STEL	

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: < 30
Density (lb/gal): 8.2
Appearance: Clear, yellow liquid.

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Flammable liquid N.O.S (Contains MEK) UN #1993
Flash Point: 55 deg F (PMCC)
Extinguishing Media: foam, carbon dioxide, dry chemical.
Unusual fire and explosion hazards: keep container closed. Isolate from heat, electrical sparks and open flame. Closed containers may explode when exposed to extreme heat.
Special Fire Fighting Procedures: standard fireman's body protection should be worn. Self-contained breathing apparatus is recommended to protect from product of combustion.

Section V: Reactivity Data

Stability: Stable

Conditions to avoid: heat, sparks and open flame.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, oxides of Nitrogen, and dense smoke.

Hazardous Polymerization: Will not occur.

Section VI: Health Hazard Data

Effects of over exposure: Inhalation may cause headache, shortness of breath, nausea, dizziness, and mucous membrane irritation.

Prolonged skin contact may result in systemic illness, and can cause irritation and possible allergic reactions.

Eye contact can cause severe irritation and possible corneal damage.

Emergency and First Aid Procedures:

Eyes....flush thoroughly with water, get medical attention.

Skin....wash thoroughly with soap and water. If a rash develops, see a physician.

Ingestion....call a physician as soon as possible.

Inhalation....remove to fresh air. Give oxygen if necessary. call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled: remove all sources of ignition. Evacuate personnel. Only properly equipped personnel with respiratory and eye protection should remain. Spill should be covered with vermiculite, sawdust or other absorbant. Spill area can be washed with detergent and water.

Waste Disposal Method: dispose in accordance with Federal, State, and Local Regulations.

Section VII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved face mask with an organic vapor cartridge or a self-contained breathing apparatus is to be provided.

Ventilation: Good mechanical ventilation is required to keep TLV (Section II) components at an acceptable level.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection: safety goggles should be worn.

Other Protective Equipment: safety shower and eye wash station should be provided.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed containers. Protect from contamination with foreign materials.

Other Precautions: do not transfer into unmarked drums. Containers

CasChem, Inc.
40 Avenue A
Bayonne, N.J. 07002

2.23

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

Section I: Identification

Trade Name: Vorite 759
Product Code: 72143
Product Class: Prepolymer
Chemical Abstract Number: 66071-12-3

HMIS/NFPA Hazard Identification System:

Health: 2 Reactivity: 1
Flammability: 1 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 03/17/87

Section II: Hazardous Ingredients

Ingredient Name	Chemical	Percent	TLV (OSHA/ACGIH)		Vapor
	Abstracts Number		By Wght.	PPM	Pressure mm Hg @68
Toluene Diisocyanate (TDI)		< 7.0		0.005	0.04 TWA
On NTP list and IARC Monograph 584-84-9				0.02	.15 STEL

Section III: Physical Data

Boiling Range: N/A
Vapor Density: Heavier than air
Evaporation Rate: Slower than ether
% Volatile by Volume: Nil
Density (lb/gal): 9.0
Appearance:

Section IV: Fire and Explosion Hazard Data

D.O.T. Category: Paint and related material.

Flash Point: 375 deg F (PMCC)

Extinguishing Media: foam, carbon dioxide, dry chemical, halon 1211.

Special Fire Fighting Procedures/Unusual Fire or Explosion Hazards:

Full fire fighter protective clothing which leaves no skin surfaces exposed and self-contained breathing apparatus are to be used. Highly toxic vapors may be generated by thermal decomposition or combustion. Isocyanates, when reacted with water generate carbon dioxide gas. Hot isocyanate may react vigorously with water. When heated, sealed containers may rupture violently.

Section V: Reactivity Data

Stability: stable

Conditions to avoid: avoid contact with oxidizing agents, water, amines and alcohols.

Hazardous Decomposition Products: products of incomplete combustion can include CO, CO₂, HCN, NO_x and TDI vapors (see section VI)

Polymerization: may occur if in contact with water or other materials that react with isocyanates.

Section VI: Health Hazard Data

Effects of over exposure:

Acute:

Inhalation of the vapors may cause severe irritation of the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Isocyanates can cause skin irritation, redding, rash, or blistering. Liquid aerosols or vapors are severely irritating to the eyes and can cause pain, tearing, reddening, and swelling. If ingested, may result in irritation and corrosive action in the mouth, stomach tissues, and digestive tract.

Chronic:

Inhalation: As a result of repeated overexposures or single large dose, certain individuals may develop isocyanate sensitization which will cause them to react to a later exposure at levels below the TLV. Symptoms which include chest tightening, wheezing, cough or asthmatic attack could be immediate or delayed up to several hours after exposure. Prolonged skin contact can result in the development of skin sensitization and could be brought on by contact with very small amounts or as a result of exposure to vapor. Prolonged eye contact with the vapor can result in conjunctivitis.

Once a person is diagnosed as sensitized to TDI no further exposure can be permitted. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases, recurrent skin eczema or sensitization should be excluded from working with this material.

Carcinogenicity: No carcinogenic activity was observed in lifetime inhalation studies in rats and mice (International Isocyanate Institute).

* Note: Toluene Diisocyanate (TDI) has been listed in the NTP Fourth Annual Report on Carcinogens. TDI has been designated as a substance that may "reasonably be anticipated to be carcinogenic" as determined by feeding studies on rodents fed with high oral doses. Furthermore, the International Agency for Research on Cancer (IARC) has used this NTP study to conclude that "there is inadequate evidence for the carcinogenicity of TDI to humans". In addition, a two year study has shown that TDI was not carcinogenic to rats.

Toxicology Data: TDI

Acute:

Oral, LD50.....: 5800 mg/kg (Rats)
Dermal, LD50.....: > 10 g/kg (Rabbits)
Inhalation, LC50....: 12.7 to 66 ppm for 1-4 hour (Rat)
Eye effects.....: strongly irritating (rabbits) OECD Guidelines
Skin effects.....: Corrosive to skin (rabbits) OECD guidelines.
Sensitization.....: Skin sensitizer in guinea pigs.

Chronic.....: Rats and mice exposed to 0.05 to 0.15 ppm TDI for two years resulted in irritation of the mucous membranes of the respiratory tract (International Isocyanate Institute). In lifetime inhalation studies conducted by Hazelton Labs for the International Isocyanate Institute, TDI did not demonstrate carcinogenic (cancer causing) activity in rats or mice.

Emergency and First Aid Procedures:

Eyes - flush thoroughly with water for 15 minutes. Get medical attention
Skin - wash thoroughly with soap and water. Remove contaminated clothing and wash before reuse. Destroy contaminated shoes. If irritation continues call a physician.
Ingestion - Do not induce vomiting. Get immediate medical attention.
Inhalation - remove to fresh air. Give oxygen if needed. If not breathing, give mouth to mouth resuscitation. Call a physician.

Section VII: Spill or Leak Procedures

Steps to be taken in case material is released or spilled:

Contain the spill. Personnel who will be engaged in cleaning up the spill are to be provided with proper respiratory, skin and eye protection. Spills should be covered with vermiculite, sawdust, or other absorbant. Absorbed material should be placed in open containers and treated with water for 24 hours before disposal. Spill area can be washed with 1-2% detergent in a 3-8% Ammonium Hydroxide solution in water. Let stand on affected area for 10 minutes.

Waste Disposal Method: dispose in accordance with State, Local and Federal regulations.

Section VIII: Special Protection Information

Respiratory Protection: a NIOSH/MSHA approved organic vapor respirator or self-contained breathing apparatus should be provided during excess or unknown exposures.

Ventilation: work area is to be provided with proper exhaust ventilation to maintain airborne concentrations below TLV.

Protective Gloves: chemical resistant gloves should be worn.

Eye Protection; safety goggles should be worn.

Other Protective Equipment: Water source should be available to wash skin or rinse eyes in case of inadvertant contamination.

Section IX: Special Precautions

Precautions to be taken in handling and storing. Store in closed

CasChem, Inc.
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Bayonne, N.J. 07002

2.24

Material Safety Data Sheet

Emergency Phone 201-858-7964
CHEMTREC 800-424-9300

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Product Code: 72034
Product Class: Prepolymer
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Flammability: 3 Protective Code: G
Threshold Limit Value (TLV):
See section II.

Printed Date: 09/20/89

Revision Date: 08/19/87

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Flash Point: 55 deg F (PMCC)
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Technical Bulletin 100

Ethers Castor Oil Chemical Derivatives

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On the cover . . .

Castor Beans, a renewable resource, are obtained from the castor plant (*Ricinus Communis*) which is grown in tropical climates throughout the world. Castor Beans are highly heterogeneous having variations in size, form and color, however, these variations do not affect the chemical composition of the oil or its content. Castor oil is the base used in the preparation of a number of unique and useful chemical derivatives.

CASTOR OIL AND ITS CHEMISTRY

A RENEWABLE RESOURCE

Castor oil, also known as Ricinus oil, is unique among all fats and oils. It is:

1. The only source of an 18 carbon hydroxylated fatty acid with one double bond,
2. "one of the few sources of naturally occurring glycerides that approaches being a pure compound,"—(Encyclopedia of Chemical Technology, Vol. 5, Third Edition ©1979 John Wiley, and Sons, Inc.).

Castor oil is regularly available on a worldwide basis from many sources. Scientific and historical records reveal that regardless of origin the chemical nature and composition are remarkably uniform.

Castor oil is a triglyceride (ester) of fatty acids. Approximately 90% of the fatty acid content is ricinoleic acid, an 18-carbon acid having a double bond in the 9-10 position and a hydroxyl group on the 12th carbon. This combination of hydroxyl group and unsaturation exists only in castor oil. The composition of castor oil fatty acids, which is remarkably constant, is shown below:

Ricinoleic Acid (12-hydroxy oleic)	89.5%
Dihydroxystearic Acid	0.7
Palmitic Acid	1.0
Stearic Acid	1.0
Oleic Acid	3.0
Linoleic Acid	4.2
Linolenic Acid	0.3
Eicosanoic Acid	0.3

The hydroxyl groups in castor oil account for a unique combination of physical properties; relatively high viscosity and specific gravity; solubility in alcohols in any proportion and limited solubility in aliphatic petroleum solvents. The uniformity and reliability of its physical properties are demonstrated by the long-time use of castor oil as an absolute standard for viscosity. Because of its highly polar hydroxyl groups, castor oil is compatible with, and will plasticize, a wide variety of natural and synthetic resins and waxes, polymers and elastomers.

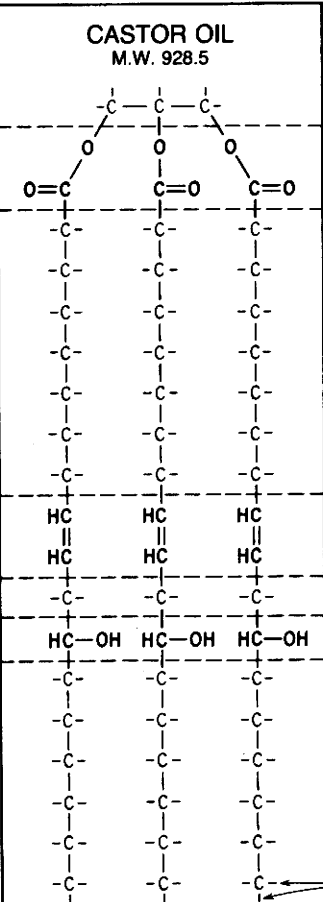
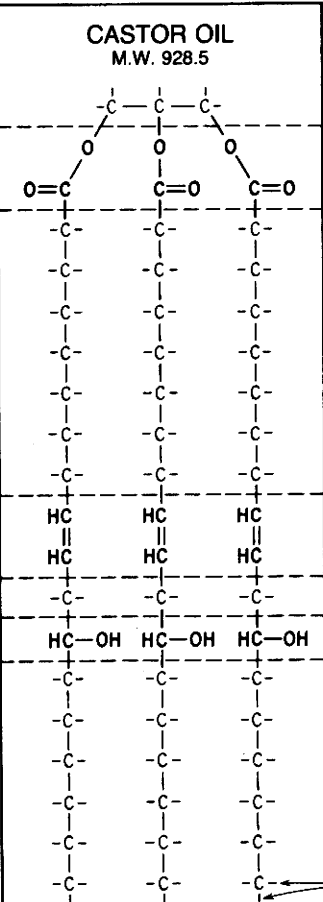
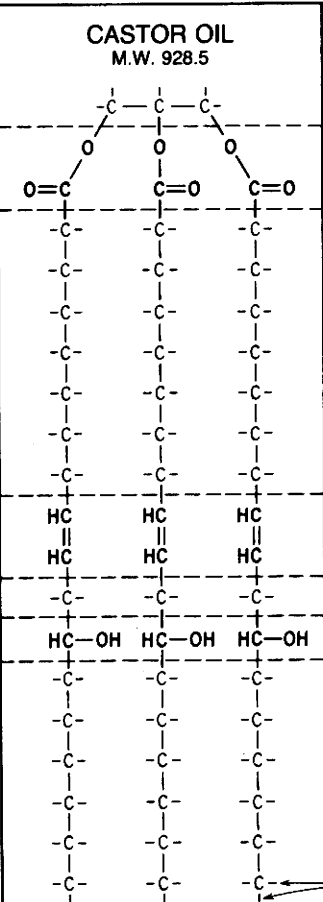
It has excellent emollient and lubricating properties and a marked ability to wet and disperse dyes, pigments and fillers. In the form of its chemical derivatives, castor oil's application versatility is further enhanced.

The hydroxyl groups, double bonds and ester linkages in castor oil provide reaction sites for the preparation of many useful derivatives. The diagram shows the fundamental structure of castor oil and its functions in these reactions.

Chemical reactions commercially used to produce important castor derivatives are as follows:

Acetylation	Hydrogenation
Alkoxylation	Isocyanate Reactions
Amidation	Oxidation
Caustic Fusion	Polymerization
Chemical Dehydration	Phosphate Esterification
Epoxidation	Pyrolysis
Esterification	Saponification
Halogenation	Sulfation

CHEMICAL REACTIONS OF CASTOR OIL

CASTOR OIL M.W. 928.5			NATURE OF REACTION	ADDED REACTANTS	TYPE OF PRODUCTS
 <p>ESTER LINKAGE</p> <p>DOUBLE BOND</p> <p>HYDROXYL GROUP</p> <p>Short ticks represent H</p>	(1) Hydrolysis	Acid, enzyme, or Twitchell reagent catalyst	Fatty acids Glycerol		
	(2) Esterification	Monohydric alcohols	Esters		
	(3) Alcoholysis	Glycerol, glycols, pentaerythritol, etc.	Mono- and diglycerides, monoglycerols, etc.		
	(4) Saponification	Alkalies Alkalies plus metallic salts	Soluble soaps Insoluble soaps		
	(5) Reduction	Na reduction	Alcohols		
	(6) Amidation	Alkyl amines, alkanolamines, etc.	Amine salts Amides		
	(7) Halogenation	SOCl ₂	Fatty acid halogens		
 <p>DOUBLE BOND</p>	(8) Oxidation, polymerization	Heat, oxygen, crosslink agent	Polymerized oils		
	(9) Hydrogenation	Hydrogen (moderate pressure)	Hydroxystearates		
	(10) Epoxidation	Hydrogen peroxide	Epoxidized oils		
	(11) Halogenation	Cl ₂ , Br ₂ , I ₂	Halogenated oils		
	(12) Addition reactions	S, maleic acid	Polymerized oils		
	(13) Sulfonation	H ₂ SO ₄	Sulfonated oils		
 <p>HYDROXYL GROUP</p>	(14) Dehydration (14a) Hydrolysis, distillation	Catalyst (plus heat)	Dehydrated castor oil Octadecadienoic acid		
	(15) Caustic fusion	NaOH	Sebacic acid Capryl alcohol		
	(16) Pyrolysis	High heat	Undecylenic acid Heptaldehyde		
	(17) Halogenation	PCL ₅ , POCL ₃	Halogenated castor oil		
	(18) Alkoxylation	Ethylene and/or propylene oxides	Alkoxyated castor oils		
	(19) Esterification	Acetic-, phosphoric-, maleic-, phthalic anhydrides	Alkyl and Alkylaryl esters Phosphate esters		
	(20) Sulfation	H ₂ SO ₄	Sulfated castor oil (Turkey red oil)		
	(21) Urethane reactions	Isocyanates	Urethane Polymers		

REFINED CASTOR OILS

Castor oil is essentially glyceryl trihydroxyoleate (tricinoleate), a clear, viscous, light colored fluid that is non drying and quite stable. Its viscosity is greater than other fatty oils and it is soluble in alcohol; insoluble in aliphatic hydrocarbons.

Castor oil has broad compatibility with oils, waxes, natural resins and gums, synthetic resins (thermosetting and thermoplastic) and cellulose. Its demonstrated characteristics are emolliency, softening and soothing to the skin, lubricity, penetration, plasticizing, surface wetting, pigment/dye dispersion, mutual solvency, adhesion promotion.

Uses and Applications

A—Chemical Reactions

Refined Castor Oils are starting raw materials for many chemical reactions. Please refer to chart on page 1.

B—General Uses

CasChem Refined Castor Oils have a broad, diverse record of uses, summarized below. Emolliency is important to all applications involving skin contact. The term "coupling solvent" reflects the unusual combination of a long fatty chain with hydroxyl group and unsaturation providing wide compatibility with oils, waxes, resins, rubber and plastic polymers.

MEDICINALS—cathartic (laxative) safe, mild

PHARMACEUTICALS—emollient, coupling solvent

COSMETICS—TOILET GOODS—PERSONAL PRODUCTS—emollient, pigment/dye dispersant, coupling solvent.

SONAR FLUID—see DB Oil

LACQUER (CELLULOSIC)—for metal, wood, fabric, paper, nail polish—plasticizer, pigment/dye dispersant

ADHESIVES (SOLUTION AND HOT MELT)—plasticizer, tackifier, penetrant

PIGMENTS AND DYES—highly efficient dispersion medium

LUBRICATION (INDUSTRIAL)—compounds for metal drawings and casting, cutting oils, soluble oils, machine lubricants, penetrants

COATINGS (NON AQUEOUS)—pigment dispersion, plasticizer, coupling solvent

SOAPS—to produce transparent bars and high solids liquids

INKS—plasticizer, tackifier, pigment dispersion, coupling solvent

LEATHER—softener and preservative

LIQUID DIELECTRIC—see DB Oil

LUBRICANT BASE—alcohol base two cycle fuel

PHENOL AND CRESYLIC ACID COMPOUNDS—solubilizer for detergents, soaps, germicides, disinfectants, engine cleaners

URETHANES—see Urethane Section on page 12

SEALANTS AND CAULKS—plasticizer and penetrant

HYDRAULIC FLUIDS AND BRAKE FLUIDS—lubricity agent

RUBBER (NATURAL AND SYNTHETIC)—plasticizer, mold release

GENERAL PLASTICIZATION—rosin, rosin esters, hydrocarbons, natural and synthetic resins and gums, phenolics (pure and modified)

WAXES AND POLISHES—penetrant, plasticizer

FIBER AND TEXTILE PROCESSING—utilizing the principles of lubricity, surface wetting, pigment/dye dispersion

PRODUCT NAME	COLOR (Gardner)	ACID VALUE	VISCOSITY Stokes @ 25°C	SPECIFIC GRAVITY 25°/25°C	IODINE VALUE (WIJS)	HYDROXYL VALUE	SAPON. VALUE	POUR POINT °F	PRODUCT INFORMATION
AA-Standard	1+	2	7.5	0.959	86	164	180	-10	Quality standard for industrial use requiring high purity, light color and low acidity
AA-USP	1-	2	7.5	0.959	86	164	180	-10	For medicinal, pharmaceutical and cosmetic uses, meeting standards of U.S. Pharmacopoeia and Cosmetics, Toiletry, Fragrance Association
Crystal O	1-	2	7.5	0.959	86	164	180	-10	Odorless and tasteless castor oil meeting standards of U.S. Pharmacopoeia.
Crystal Crown	1-	2	7.5	0.959	86	164	180	-10	Odorless and tasteless castor oil containing F.D.A. approved anti-oxidant. Listed in Directory of Raw Materials (C.T.F.A.)
DB Oil	1+	0.6	7.5	0.959	86	164	180	-10	Super refined castor oil for specific applications requiring maximum purity with minimum acidity and moisture;—sonar fluid, liquid dielectric, urethane reactions
#1 Oil	2+	2	7.5	0.959	86	158	180	-10	Technical grade for industrial use

POLYMERIZED OILS

These castor polymers have increased viscosities resulting from cross-link and oxidative polymerization at the double bonds and hydroxyl groups. The nondrying characteristic and limited solubility are retained. The polymer structure enhances plasticizing efficiency, lubricity and resin/plastic compatibility. These products are superior agents for wetting and dispersing pigments. They are useful in lacquers as plasticizers/dispersants and are permanent, not subject to volatilization such as the short chain ester plasticizers.

Castor polymers feature light color, compatibility and high gloss. The high viscosity polymers impart toughness and bridging in lacquers (penetration control).

Basic Characteristics

Viscosity greater than most fatty oils

Soluble in alcohol; insoluble in aliphatic hydrocarbons

Broad compatibility with natural resins and gums, and with synthetics, both thermosetting and thermoplastic

General plasticizer for resins, gums, polymers

Lubricity agent

Penetrant

Surface wetting agent

Pigment and dye dispersant

Coupling solvent

Adhesion promoter

Uses and Applications

CELLULOSE LACQUERS—for metal, wood, leather, paper, fabrics, nail polish; imparting flexibility, toughness, gloss, adhesion, abrasion resistance. As plasticizer components the castor polymers permit high solids. Aid in sanding and rubbing. Pigment dispersant.

INKS—resin and binder plasticizer, media for dispersion of pigments and dyes. Penetration and adhesion.

ADHESIVES: HOT MELT & SOLUTION—plasticizer and coupling solvent for resins and modifiers.

LUBRICATION—industrial lubricants and penetrants. Plug valve lubricant base (oil and solvent resistance).

POLISH—wood and metal, for permanence and high gloss.

CAULKS AND SEALANTS—flexibility, penetration, adhesion.

LEATHER DRESSING—flexibility, permanence.

TACK RAGS—dust pick up.

HYDRAULIC FLUIDS—lubricity additive, safe on rubber and plastics.

RUBBER COMPOUNDING—“nerve” reduction, milling aid. Reacted with sulfur to produce factice (vulcanized oil), an elastomeric processing aid.

GASKET CEMENT—resin binder and plasticizer.

PRODUCT NAME	VISCOSITY STOKES @ 25°C	COLOR (Gardner)	ACID VALUE	SPECIFIC GRAVITY 25/25°C	IODINE VALUE (WIJS)	HYDROXYL VALUE	SAPON. VALUE	POUR POINT °F
Pale 170	11	2	4	.970	80	160	184	-5
Vorlte 105	26	4	2	.975	85	130	170	-5
Pale 4	32	4	16	.998	70	158	212	5
Vorlte 110	115	3	2	.990	82	102	166	15
Pale 1000	120	9	20	1.018	59	139	230	25
Vorlte 115	192	3	2	.995	85	93	165	20
Pale 16	250	9	24	1.025	56	136	237	25
#15 Oil	250	11	14	1.013	64	137	220	35
#30 Oil	500	13	13	1.019	63	136	220	45
Vorlte 120	700	4	2	1.001	82	78	160	50
#40 Oil	800	14	13	1.020	60	135	225	50
Vorlte 125	900	4	2	1.007	84	72	157	55

CONJUGATED DRYING OILS

CASTUNG DEHYDRATED CASTOR OIL

Castor oil is converted to a drying oil when the hydroxyl group and an adjacent hydrogen are removed from each 18 carbon chain by catalytic thermal treatment under vacuum. The hydroxyl and hydrogen are withdrawn as water, hence the expression "dehydrated castor." The process yields an additional double bond in the conjugated position permitting rapid polymerization and drying speed.

Basic Characteristics

Castung 103 GH is a light colored, low viscosity oil (1.8 poise minimum) with low free acidity. It is a triglyceride characterized by a very high linoleic acid content. This feature and the absence of linolenic acid account for the light color and non-yellowing nature of its dry film. Drying is initiated by conventional oil based driers. Castung oils are noted for their combination of drying and curing speed, flexibility, adhesion, chemical resistance, impact resistance, toughness, gloss, water resistance,—all properties that are utilized in oleoresinous varnishes, alkyd and polyester resins, and many of the more ad-

vanced copolymer systems for solvent based coatings.

Polymerization through carbon-to-carbon linkages produces higher viscosities,—Castung 403 UV and 403 Z3. These are more reactive, the polymerization and drying rates being faster than for Castung 103 GH.

The Castungs are the most versatile drying oils in terms of total properties and greater reactivity within a safe range of processing.

Uses and Applications

As superior drying oils the Castungs may be used as primary binders to upgrade housepaints, enamels, caulks, sealants and inks. In "cooked" varnishes they combine with all the basic resins, rosin, rosin-esters, hydrocarbons and phenolics to produce clear varnishes and vehicles for pigmented coatings. In varnishes, alkyds and complex copolymers, they provide impact resistance, flexibility, gloss, chemical resistance, adhesion, flow and leveling.

The major applications are in high quality durable vehicles. These include corrosion resistant coatings, traffic paints, wire enamels, can linings, marine finishes, coil coatings, metal decorating, can and tube coatings, aluminum paints, primers, and appliance finishes.

PRODUCT NAME	ACID VALUE	IODINE VALUE (WIJS)	TOTAL IODINE VALUE	SAPON. VALUE	SPECIFIC GRAVITY 25°C/25°C	COLOR (Gardner)	VISCOSITY stokes @ 25°C	POUR POINT °F	
Castung 103 G-H	4	136	156	190	0.931	4	1.8	- 50	
Castung 403 U-V	4	130	155	190	0.942	4	7.5	- 35	
Castung 403 Z-3	4	123	151	190	0.949	4	46	- 5	
Copolymer 186	13	128	163	169	0.968	7	250	+ 30	
Copolymer 186-85	11	113	138	142	0.937	6+	27	-	

CONJUGATED DRYING OILS

COPOLYMER 186, SPECIAL CASTUNG VEHICLE

Copolymer 186 is a Castung derivative used in the preparation of quality varnishes and coating vehicles by cold blending. It eliminates the inconvenience of varnish cooking or kettle reactions, and problems of fume control/air pollution.

Copolymer 186 is a polymer designed to produce vehicles with outstanding properties and performance, **by blending with resins at room temperature**. It provides a substantial improvement in total properties over conventional drying oils such as tung, dehydrated castor oil, oiticica, linseed and safflower. It is **not** related to products obtained by copolymerizing a drying oil with styrene, vinyl toluene, maleic anhydride, or acrylic monomers.

Copolymer 186/resin cold blends should be considered for applications where an alkyd, epoxy ester, urethane alkyd or oleo-resinous varnish is now being used. Outstanding performance has been demonstrated repeatedly through exterior durability testing, including test fence studies of critical coatings such as clear exterior finishes.

Copolymer 186 is compatible with all the major coating resins and is supplied as a concentrate or with 15% solvent as Copolymer 186-85.

Uses and Applications

Copolymer 186 blended with hydrocarbon or phenolic resins produce excellent vehicles for aluminum pigments. Topcoats and primers have demonstrated superior weathering, water resistance and anti-corrosive properties. Storage tests on paint prepared from these vehicles have shown excellent retention of leafing properties and no viscosity change after one year.

Copolymer 186 is also used to modify alkyds. It is used in the preparation of alkyd resins to increase the oil length. Alkyds prepared with Copolymer 186 impart better flexibility, impact resistance toughness without adversely affecting water and chemical resistance.

Copolymer 186 can also be used to upgrade inexpensive drying oils. The addition of Copolymer 186 to these oils usually improves dry, toughness, hardness, water and chemical resistance. A 25% replacement of low priced drying oils with Copolymer 186 is recommended as a starting point.

Since Copolymer 186 is a drying oil that provides chemical resistance, water resistance, and toughness superior to other oils, it is also useful in such applications as concrete anti-spalling compounds, binders, caulks and sealants.

SPECIAL CASTUNGS

Partially dehydrated castor oils can be supplied on order. These offer drying-curing characteristics with some available hydroxyl groups—ideal structures for further reaction (polymerization and reaction of the hydroxyl). Specific inquiries are invited.

PRODUCT INFORMATION

Unbodied Castung is used with pure and modified phenolics to obtain fast dry coatings with maximum alkali resistance as required in sanitary can linings, corrosion resistant coatings, traffic paints, varnishes, ink vehicles, wire enamels and marine finishes. It provides internal plasticization more effectively than any other drying oil. Castung 103 G-H is preferred for alkyd and copolymer resins. Castung 103 G-H is a valuable addition to architectural house paints and enamels for gloss and flow.

Medium viscosity polymerized oil. Faster processing and drying than 103 G-H. Good kettling rate with difficult-soluble resins. Meets specification MIL-O-15179A.

Polymerized Castung. Fast kettling rate produces lighter color, lower acid varnishes; compatible with most resins; recommended for use with modified phenolics and in petroleum resin-based cold-cuts. Modifier for increased brushability and gloss in exterior paints and enamels. Ideally suited for aluminum paint vehicles because of its fast dry, flexibility and low acidity.

Copolymer 186 permits the preparation of quality coating vehicles by cold blending. It is compatible with a wide range of resins (phenolic, modified phenolic, rosin esters, hydrocarbons and alkyds) at room temperature.

FATTY ACIDS

Three types of long chain monobasic acids are derived from castor oil; **HYDROXYLATED ACIDS** which retain the hydroxyl group and double bond, **UNDECYLENIC ACID** resulting from the catalytic conversion of castor oil and **CONJUGATED ACIDS**.

HYDROXYLATED FATTY ACIDS

Carefully controlled hydrolysis of refined castor oil yields ricinoleic acid (hydroxyoleic acid). 12-hydroxystearic acid is the saturated counterpart produced from hydrogenated castor oil. Neither is subjected to distillation which would cause thermal degradation of the hydroxyl group.

P-10 ACID

A light colored liquid, consists of approximately 90% hydroxyoleic acid, the standard technical grade of ricinoleic acid.

FLEXRICIN 100

Flexricin 100 is a variant of P-10 Acid with lower acid value and hydroxyl value. The lubricant and emollient properties are quite effective. Use suggested where lower reactivity is required.

Uses and Applications

The C-18 fatty chain with hydroxyl group and double bond provide a unique combination of reaction possibilities. The soaps, amine compounds and esters are used in cutting oils, industrial lubricants, emulsifiers and metal working compounds. Transparent bar soaps and high solids liquid soaps are made possible by the hydroxyoleic structure. This feature enables the solubilization of phenolic and cresylic bodies in industrial germicides, disinfectants and heavy duty detergents.

Polarity and surface wetting are important in the dispersion of pigments and dyes. Thus P-10 Acid is utilized in inks, coatings, plastics, cosmetics and toilet goods.

In resin synthesis P-10 Acid is effective modifier for coatings and adhesive polymers such as the highly durable thermosetting acrylics and non-drying plasticizing esters.

In the processing of fibers and textiles, hydroxyoleic acid provides polarity, surface wetting and important reaction sites. Textile processing agents including lubricants and softeners are in use based on amination, esterification, sulfation, saponification and ethoxylation.

12-HYDROXYSTEARIC ACID

This is the saturated counterpart of P-10 Acid. It is hard, buff colored and waxy, similar to stearic acid except for the presence of the hydroxyl group.

Uses and Applications

12-Hydroxystearic acid is a major component in lithium and calcium base multi-purpose lubricating grease. The high melting point hydroxyl bearing chain produces glycerine-free gel structures of great strength and workability,—the dominant feature of these heavy duty greases.

The hydroxystearic characteristics are used in cosmetic and toilet goods, wax blends, polishes, inks and hot melt adhesives.

In coating resins the hardness, high melting point, and reactive hydroxyl are utilized in both solvent and water based polymers, and in plasticizer systems. 12-Hydroxystearic acid is reacted with acrylic esters to produce hard, durable thermosetting polymers used in the high quality automotive, industrial, appliance and metal decorative finishes.

UNDECYLENIC ACID

Pyrolysis of castor oil produces undecylenic acid (11-undecenoic acid) which has eleven carbons with vinyl unsaturation. It is one of the few odd numbered acids.

Undecylenic acid exhibits excellent fungicidal and bactericidal properties. Being the most potent acid, it is still mild to the skin and not destructive. It meets the National Formulary requirements for use in fungicides. It is used in industrial fungicides and bactericides.

The eleven carbon chain structure, with vinyl unsaturation, suggests use as an intermediate in chemical syntheses, polyamide plastics and fibers, perfume bases and synthetic floors.

PRODUCT NAME	ACID VALUE	IODINE VALUE (WIJS)	HYDROXYL VALUE	SAPON. VALUE	SPECIFIC GRAVITY 25°C/25°C	COLOR (Gardner)	VISCOSITY stokes @ 25°C	POUR POINT °F	PRODUCT INFORMATION
P-10 Acid (Ricinoleic acid)	180	89	162	186	0.940	5	4	10	A liquid, hydroxy fatty acid with a double bond in the 9-10 position and a hydroxyl on the 12th carbon. It imparts lubricity and rust-proofing qualities to soluble cutting oils. Basis for grease, soaps, resin plasticizers and ethoxylated derivatives.
Flexricin 100	120	90	95	186	0.934	7	4	-15	Chemical intermediate for water soluble/dispersible lubricants.
Hydroxystearic Acid	180	3	178	186	1.021	6	flakes	76°C MP	Saturated hydroxylated substitute for stearic acid.
Undecylenic Acid (N.F.)	297	135	—	303	0.912	1	0.1	22°C MP	Conforms to MIL-F-36000.

CONJUGATED FATTY ACIDS

The conversion of Castung dehydrated castor oil to the acid is accomplished by hydrolysis to yield #135 Acids. This product is then distilled, producing "9-11 Acid," a high purity conjugated fatty acid.

Refined castor oil contains 4% linoleic acid which is substantially increased during dehydration so that in 9-11 acid, the total linoleic content is 94%, of which 60% is conjugated 9-11 octadecadienoic acid.

CasChem's 9-11 Acid is unique for several reasons:

Negligible amount of linolenic acid, a yellowing factor

Combined oleic and saturated acids are less than 10%

Absence of rosin acids

Absence of unsaponifiable matter

CasChem 9-11 Acid provides versatility by allowing reactions to occur at the conjugated double bonds and at the carboxylic acid end group. Hence, either functional group can be used to form the polymer backbone leaving the remaining functional group for further reactions.

Reactions most common at the carboxylic acid end group are:

—Salt formation

—Esterification

—Amide formation

Reactions most common at the conjugated double bonds are:

—Free Radical Polymerization

—Oxidation

Although CasChem 9-11 Acid contains approximately 60% conjugation, during copolymerization or polymerization a portion of the non-conjugated linoleic acid isomerizes to the conjugated position, thus, maintaining the ratio of the two linoleic isomers throughout the polymerization process.

The net effect is the high level of conjugation and purity provides faster rates of polymerization while maintaining low viscosity.

Uses and Applications

CasChem's 9-11 Acid is well suited to reactions in standard

resin systems: alkyds (phthalic, isophthalic, pentaerythritol, trimethylolthane, glycerin) and alkyds modified with styrene, vinyltoluene, acrylate and methacrylate esters. 9-11 Acid is used in the manufacture of high solids alkyds, acrylic and epoxy ester resins. This usage is principally for Original Equipment (OEM) product finishes such as interior sanitary lining can coatings, exterior can coatings, appliance finishes, automotive topcoats and primers and coil coatings. As chemical intermediates 9-11 Acid is used in Diels-Alder reactions, including vinyl adducts, to form addition products with fumaric, maleic and acrylic acids, vinyltoluene and acrylonitrile.

As the fatty acid component in resin/polymer systems, 9-11 Acid provides excellent performance including:

adhesion

flexibility

color retention in

baking and overbaking

abrasion resistance

hardness

cure speed

post forming

impact resistance

exterior durability

Resistance to:

water

detergents

food stains

chemicals

corrosion

These properties are utilized in a broad list of resin/polymer systems generally directed to coatings, inks and adhesives. They are applicable to resin systems based on 100% solids, solvent based and water based formulations. The following are typical examples of the high performance coatings in which 9-11 Acid usage is indicated.

Coil Coatings

Appliance and

Product finishes

Automotive, primer

& finish coat

Automotive refinish

Tube Coatings

Marine finishes

Maintenance Primers

and Topcoats

Containers for Foods &

Beverages (Interior/

Exterior)

Overprint Varnishes

High Speed Printing Inks

PRODUCT NAME	ACID VALUE	IODINE VALUE (WIJS)	TOTAL IODINE VALUE	SAPONIFICATION VALUE	SPECIFIC GRAVITY 25°C/25°C	COLOR (Gardner)	VISCOSITY stokes @ 25°C	POUR POINT °F
9-11 Acid	198	153	180	199	0.903	1	0.3	10
135 Acids	193	141	161	196	0.915	5+	0.7	10

ESTERS

HYDROXYOLEATES AND HYDROXYSTEARATES

The CasChem esters are important because they exemplify the quotation "... one of the few naturally occurring glycerides that approaches being a pure compound."

The castor esters are characterized by their high purity and unique structure. The polar hydroxyl in the long chain is normally associated with surface wetting, lubricity and emulsification. Esters are available from alcohol or glycol reactions leaving a free hydroxyl at the 12th carbon. Additional linkages are made at this position.

Solubility and melting point vary according to the structure and unsaturation. Further diversity results from mono, di, and tri ester structures, and various chain lengths. This provides a wide range of viscosity, melting point, compatibility, solubility and oxidation stability. In terms of applications, the esters are summarized in the following categories:

PLASTICIZATION is characterized by:

Excellent flexibilizing; good "hand" and "drape"

Low temperature effectiveness, permanence, low volatility

Internal lubricity, evidenced also as mold release

Surface wetting and dispersing action

Good electrical properties. Low dissipation factor, high volume resistivity and dielectric constant

The plasticizing effect is identified with natural and synthetic rubbers and resins such as vinyls, phenolics, polyvinyl butyral, rosin and its esters, Vinsol and cellulose. Nerve breaking, reduction of polymer viscosity, and internal lubrication are key properties of CasChem esters.

LUBRICATION

This characteristic is so significant as to find broad application. In many instances the esters are used as direct lubricants, but their properties enable use as lubricity additives for mineral oil bases, high melting point wax-like systems and water solubles. Wide selectivity is available, the choice depending on viscosity, compatibility, stability and wear qualities. CasChem esters have a long record of practical, efficient service in industrial lubricants, cutting oils, soluble oils, metal working compounds, packing, sealants, plug valve greases, drawing

PRODUCT NAME	ACID VALUE	IODINE VALUE (WIJS)	HYDROXY VALUE	SAPON. VALUE	SPECIFIC GRAVITY 25°C/25°C	COLOR (Gardner)	VISCOSITY stokes @ 25°C	POUR POINT °F	
Flexricin P-1 (Methyl ricinoleate)	3	85	170	178	0.925	3	0.3	-20	
Flexricin P-3 (Butyl ricinoleate)	3	77	163	158	0.919	3	0.3	-15	
Flexricin P-4 (Methyl acetyl ricinoleate)	2	75	5	301	0.936	3	0.2	-15	
Flexricin P-6 (Butyl acetyl ricinoleate)	2	68	5	275	0.931	4	0.2	-25	
Flexricin P-8 [Glyceryl tri(acetyl ricinoleate)]	1	76	5	300	0.967	2	2.4	-40	
Paricin 6 (Butyl acetoxystearate)	4	2	5	276	0.918	2	0.3	20	
Paricin 8 [Glyceryl tri(acetoxystearate)]	1	2	5	298	0.955	1	1.8 @ 37.8°C	30	
Flexricin 9 (Propylene glycol mono-ricinoleate)	2	77	288	159	0.960	2	3.0	-15	
Flexricin 13 (Glyceryl mono-ricinoleate)	5	77	345	160	0.985	2+	8.8	20	
Flexricin 15 (Ethylene glycol mono-ricinoleate)	2	81	260	170	0.965	2	3.7	-5	
Flexricin 17 (Pentaerythritol mono-ricinoleate)	3	74	328	157	0.999	8	31.0	0	

ESTERS

compounds, and 2 cycle alcohol based fuel-lubricant mixtures.

One of the broadest applications deals with the processing of textiles and fibers. This requires lubricity both for metal, over which the fiber and textiles are handled, and to assure protection of the fiber itself. CasChem esters have played an important role in the treatment of both natural and synthetic fibers. They are used in softening agents, finishing agents, emulsifiers, defoamers and wetting agents. The polar hydroxyl group is conducive to emulsification, and the long chain offers heat stability, a major factor in textile processing.

ELECTRICAL AND SONAR

DB oil has very high purity with low acidity and moisture, free from foreign matter. These conditions account for its long usage as a Sonar Fluid. Its electrical properties are equally important in high performance condensers, transformers and energy storage capacitors. Other castor esters such as Flexricin P-8 and Paricin 8 have shown advantages as a dielectric liquid in high performance capacitors, transformers and energy storage capacitors.

DISPERSANTS FOR PIGMENTS AND DYES

The combination of surface wetting and lubricity is ideal for all types of coatings, inks and plastics. Nitrocellulose lacquers and inks are pigmented with castor based esters which are also built-in non-volatile plasticizers. Adoption of these basic principles finds current usage of esters ranging from low viscosity to high melting point solids. The latter are important to high concentration color chips for the plastics industry, for colored pencils, crayons, hot melt adhesives, and transfer inks. For detailed information see page 18.

CHEMICAL INTERMEDIATES

Castor esters are starting materials for chemical reactions, or adducts. The alkyl esters can be used in the preparation of alkanolamides. Also, the production of esters by transesterification eliminates the need for using ricinoleic acid. The castor esters are well suited to sulfation, and alkoxylation.

PRODUCT INFORMATION

Low-temperature plasticizer for rubber polymers; produces low durometer stock. Lubricant-plasticizer in phenolic molding resins. Plasticizer for epoxy resin systems.

Outstanding plasticizer for polyvinyl butyral, rosin, Vinsol resin, and cellulose acetate butyrate. General purpose plasticizer for nitro-cellulose, ethylcellulose.

All-purpose ester plasticizer for lacquers and vinyls. Plasticizer and processing aid for low-temperature specification rubber compounds. Low volatility. Confers exceptional cold crack resistance and plate release to flexible nitrocellulose lacquers; widely used in leather finishes.

Highly efficient plasticizer for nitrocellulose lacquers, imparting excellent plate release, cold crack resistance and high gloss. Provides good permanence and is often used in conjunction with polymerized castor oils. Used as a lubricity agent in textile finishes.

Very low volatility. Excellent electrical properties, extrusion lubricity and heat stability. Used in vinyl wire-jacketing, semi-rigid vinyls and flexible nitrocellulose lacquers.

Oxidation-stable plasticizer for vinyls; used in plastisols for non-exudation, easy deaeration and maintenance of low viscosity. Low Viscosity, saturated ester for lubrication penetration.

Lubricant plasticizer for vinyls, especially high-temperature wire jacketing. Negligible volatility, outstanding electrical properties and extrusion lubricity. Heat and oxidation-stable. An excellent grinding medium for pigment dispersions, especially for vinyls. An outstanding plasticizer for nitro-cellulose, conferring flex-life retention and minimal color development. Excellent high temperature lubricant for metals.

Di-hydroxy ester. Wetting agent, dye solvent, wax plasticizer. Confers high dye-carrying efficiency and penetration in lipstick formulations. Chemical intermediate.

Tri-hydroxy ester. Wetting agent, wax plasticizer, plasticizer and mold release agent for rubber polymers anti-foam agent. Meets Specification OS9784A (Dept. of Navy, Bureau of Weapons). Used in binder of rocket propellants. Chemical intermediate.

Di-hydroxy ester. Plasticizer, chemical intermediate, component in hydrocarbon resistant plug valve greases having good low temperature, low viscosity properties.

Desirable combination of three primary hydroxyls with secondary hydroxyl on the long chain. Chemical intermediate.

HYDROXY WAXES

The addition of hydrogen changes castor oil to a hard, brittle, wax known as Castorwax, or Opalwax. The saturation of double bonds converts each hydroxyoleic chain to hydroxystearic. The resulting triglyceride is characterized by extreme insolubility, very narrow melting range, lubricity, excellent electrical properties, pigment and dye dispersibility, and coupling action for immiscible waxes, resins, rubbers and polymers.

Castorwax is insoluble in most organic solvents at room temperature. Small amounts can be dissolved in chloroform or chloroform/butanol blend. Solubility is good in hot solvents but in most the Castorwax will solidify on cooling. A narrow melting range is due to the high purity of castor's structure, 90% ricinoleic acid.

The insolubility is utilized in all types of systems requiring resistance to water, oils and fats, crude petroleum and derivatives. The lubricity feature is used in solid lubricants, drawing compounds and metal working products. The compatibility of Castorwax with waxes, both natural and synthetic, resins, rubbers and polymers is utilized in high melting point systems as a mutual solvent or coupling agent.

Examples of these properties are seen in paper coatings (solution or hot melt) for food packaging including bakery goods and candies. The lubricity and resistance to solvents and oils are utilized in special lubricants such as plug valve greases. In cosmetics and pharmaceuticals the emolliency and pigment/dye dispersant properties are important—as are the compatibility with oils, resins and esters. Hydrogenated castor oil is recognized for the ability to develop maximum pigment density in liquid toners for electrophotographic material. Internal lubrication and mold release in plastic processing supplement the coupling action with resins and polymers. The high melting point, hardness and minimum shrinkage are critical to hot melt composi-

tions such as adhesives, sealants and textile transfer inks based on cellulose, acrylates, vinyl butyrals and the various hard resins. Castorwax functions efficiently, generally reducing the melt viscosity.

Uses and Applications

Metal Drawing Lubricants	Cosmetics and Toiletries
Packing and Sealants	Investment Casting
Processing aid for Rubber and Plastics	Pencils & Crayons
Strippable Coatings	Tabletting, - Controlled release binder
Dielectric Compounds	Lipstick
Carnauba Wax substitute	Anti-perspirant Sticks
Wax Polishes	Potting Compounds

Castorwax is the source of 12-hydroxystearic acid for lithium and calcium base lubricating greases. These multi-purpose greases have outstanding workability and life, long range stability, high drop point and water resistance.

Castorwax MP-70 and MP-80 are variations in which the hardness/brittleness are not so extreme. Greater flexibility and ductility are available with improved solubility. The applications, generally similar to those for Castorwax, are important to formulators of Cosmetics and Toiletries.

Other wax-like derivatives of this group include the methyl ester of 12-hydroxystearic acid, glycol esters and glyceryl mono-ester. Each provides the classical castor oil-Castorwax properties with variations introduced by the alcohol/glycol substitution on the hydroxystearic chain. This means differences in hydroxyl value and molecular weight, thus changes in melting point and hardness. The basic characteristics of lubricity, pigment/dye dispersion and coupling agent remain unchanged.

PRODUCT NAME	ACID VALUE	IODINE VALUE (WIJS)	HYDROXYL VALUE	SAPON. VALUE	SPECIFIC GRAVITY 25°C/25°C	PENETRATION HARDNESS	MELTING POINT °C	PRODUCT INFORMATION
Castorwax	2	3	158	180	1.02	2	87	Conforms to MIL-P-2018A.
Castorwax MP80	2	29	158	180	0.98	9	80	Modification of Castorwax with broader melting ranges, greater flexibility and improved solubility-compatibility.
Castorwax MP70	2	38	158	180	0.98	42	70	
Pariclin 1 (Methyl hydroxystearate)	5	3	164	179	1.02	19	52	Lubricant/processing aid for butyl rubber. Wax firming agent in cosmetics and specialty inks. Source of hydroxystearic acid for glycerine-free multi-purpose lithium greases.
Pariclin 9 (Propylene glycol mono-hydroxystearate)	4	4	289	160	1.03	12	53	Soluble in alcohols and ketones. Wax modifiers, firming agents in pharmaceuticals and cosmetics (hair preparations, lipsticks), slip additives in varnishes. Physical properties approach those of spermaceti for Pariclin 9, beeswax for Pariclin 13 and candelilla wax for Pariclin 15.
Pariclin 13 (Glyceryl mono hydroxystearate)	6	5	320	162	1.05	15	69	
Pariclin 15 (Ethylene glycol mono-hydroxystearate)	3	5	266	169	1.02	5	66	
Pariclin 18 (Stearyl 12-hydroxystearate)	2	3	91	90	0.97	11	69	Saturated, low melting point wax.

HYDROXYAMIDE WAXES

RICINOLEAMIDES AND HYDROXYSTEARAMIDES

These are produced by the reaction of amines with the carboxyl group of ricinoleic and hydroxystearic acids. Possessing one or more hydroxyls they are high melting point wax-like materials. The hydroxystearamides are very hard waxes, the ricinoleamides are softer, and both are extremely resistant to alkalis and acids—in contrast to the natural and synthetic ester waxes.

The amide waxes are insoluble in most organic solvents. They are broadly compatible with natural waxes, paraffins, gums, rosins and synthetic resins, cellulose, polyvinyl chloride, polyethylene, polypropylene, polystyrene and rubber polymers. In addition to providing slip, antistatic and lubricating properties to the various polymer resins, the hydroxyl group provides needed compatibility during processing and aids in the dispersion of pigments and other additives when compounding. Finished molded and extruded articles have improved gloss and a reduced tendency to build electrostatic charges on their surfaces.

The significant features of these unique castor derivatives are:

Broad compatibility	Thermal stability
Lubricity	Chemical inertness
Hard wax-like structure	Strong coupling solvent action
Excellent electrical properties	Slip property
Wetting and surface activity	Dispersing action

These properties typify the extra performance characteristics attributed to the hydroxylated long chain structure. The selection of Flexricin and Paricin products is generally related to the type of polymer system, melting point, hardness, thermal stability and the required solubility/compatibility. The latter feature is a function of the unsaturation and hydroxyl value.

Uses and Applications

Packings and sealants
 Mold lubricant and release agent in plastic extrusion, molding and calendering
 Viscosity reducer for polymer—resin hot melts
 Anti-static agent for textile processing
 Solid pigment dispersant for color concentrates used in plastics, inks and coatings. See page 18
 Plasticizer—coupling agent for hot melt adhesives and textile printing compounds
 Wire drawing and metal working lubricants
 Binder-lubricant for powdered metals
 Investment casting waxes
 Processing aid for rubber, plastics and polymers
 Electrical casting compounds for potting condensers and transformers. Cable filling and insulation coatings
 Anti block, anti static agent for inks, adhesives and coatings
 Lubricant base for plug valve greases

PRODUCT NAME	ACID VALUE	IODINE VALUE (WIJS)	HYDROXYL VALUE	SAPON. VALUE	SPECIFIC GRAVITY 25°C/25°C	PENETRATION HARDNESS	MELTING POINT °C	PRODUCT INFORMATION
Flexricin 115 N(beta Hydroxy Ethyl) Ricinoleamide	5	80	295	15	1.00	90	46	Have good lubricating and anti-static properties. Lubricant for plastics and metals; mold release agent; anti-blocking agent for textile coatings; slip agent for varnishes and lacquers. Raise tack-free point of hot-melt compositions. Other uses include electrical potting compounds, plug valve lubricants, crayons, wax blends, high-temperature greases. The high melting point waxes are used as anti-blocking agents in high speed inks and coatings for labels and aluminum foil.
Flexricin 185 N,N' Ethylene Bis- Ricinoleamide	5	93	159	11	1.02	19	89	
Paricin 210 (N Stearyl 12 hydroxystearamide)	1	5	93	10	0.98	1	102	
Paricin 220 N(2 Hydroxy ethyl)-12 Hydroxystearamide	1	4	300	14	1.05	1	104	
Paricin 285 N,N' Ethylene Bis 12-Hydroxystearamide	4	4	165	14	1.02	1	140	

POLYURETHANE SYSTEMS AND CHEMICALS

Vorite/Polycin Polyurethane Systems for Telecommunication/Electrical Applications

Urethane polymers result from the reaction of hydroxyl groups (-OH) in polyols with isocyanate groups (-NCO) in polyisocyanates or prepolymers. Castor oil has three hydroxyl groups and reacts with di- or polyisocyanates to form cross-linked urethane systems (elastomers, coatings, binders, etc.).

Polyols derived from castor oil, of varying functionality, are available for use in urethane reactions. These polyols differ chemically from the polyester and polyether polyols used in the preparation of urethanes. They have fewer ester groups than polyesters, contain no ether linkages as found in the polyethers, and are therefore more hydrolytically stable than these other polyols.

The ricinoleate polyols exhibit exceptional pigment-wetting ability. Their pigment and dye carrying capacity is used for efficient color incorporation. Furthermore, low shear is required when making such dispersions, offering optimum production efficiency.

CasChem's identification for its urethane polyols is "Polycin" followed by a number.

Urethane prepolymers of varying reactivity are available for use in urethane reactions. A prepolymer is the reaction product of a polyol with excess polyfunctional isocyanate and is capable of further reaction with polyols. CasChem's identification for its urethane prepolymers is "Vorite" followed by a number.

The following sections describe CasChem's Vorite/Polycin urethane systems developed for use in the telecommunications and electrical industries. Biothane urethane systems for use in the biomedical and industrial filter industries, and urethane chemicals for use in coatings applications.

The urethane systems described in this bulletin are only a partial listing of the many systems that can be formulated by CasChem. CasChem has been manufacturing and formulating urethane systems for more than twenty years. Our technical staff is available for formulating systems specifically designed to meet your performance and processing requirements.

VORITE/POLYCIN POLYURETHANE SYSTEMS FOR TELECOMMUNICATION AND ELECTRICAL APPLICATIONS

The Vorite/Polycin polyurethane systems have been serving the telecommunications, electrical, and electronic fields for over twenty years. CasChem offers a complete line of two-component polyurethane systems specifically designed for use in potting and encapsulation of components used by these industries.

These systems consist of two liquid components, the Vorite prepolymer and the Polycin polyol, which are easily mixed and cure at room temperature to yield urethane elastomers having outstanding properties. They offer the following advantages over other polyurethanes: lower stress at high hardness, better moisture repellency (low moisture vapor permeability and water absorption), better hydrolytic stability, better shock and sound absorption, better handling properties (less sensitive to moisture and consequent gassing), low viscosity, good adhesion, good chemical resistance, excellent electrical properties. They are unique for their low stress/strain properties, low exotherm on curing and low shrinkage, thus not adversely affecting pressure or temperature sensitive equipment. They are non-corrosive to copper, and are compatible with materials commonly found in electrical apparatus. The table covering telecommunication/electrical applications lists some of CasChem's Vorite/Polycin systems that have been widely accepted in the telecommunications, electronic, and electrical industries. Typical applications are: potting and encapsulation of load coils, mercury and reed relays, voltage regulators, transformers, cable plugging, cable splice encapsulation, circuit embedment, transistorized ignition systems, and shock absorbers.

SYSTEM #	COMPONENTS	MIX RATIO (PSW)	VISCOSITY (CPS) @ 25°C		HARDNESS (SHORE)	TENSILE (PSI)	ELONGATION (%)	TEAR (PLI)	GEL TIME (MINUTES)	DENSITY (g/cc)	PRODUCT INFORMATION
			COMPONENTS	MIX							
86	Vorite 683 Polycin 876-M4	44 56	8400 500	1300	80A	2000	95	200	45	1.174 0.973	System 86 is a medium hardness, low viscosity polyurethane casting compound. The Vorite prepolymer does not contain TDI and has a low vapor pressure, thereby minimizing the potential vapor hazard. This system has been recommended for potting audio transformers, inductors, and capacitors.
88	Vorite 689-M2 Polycin 876-M4	50 50	9800 500	1450	50D	2500	200	400	80	1.168 0.973	System 88 is a relatively hard, low viscosity, non-TDI based polyurethane for potting and encapsulating applications which require good mechanical properties. It is recommended for a diversity of applications including potting transformers, coils, transducers.
90	Vorite 689-M2 Polycin 640-M2	55 45	9800 560	2500	70D	3000	100	1000	85	1.168 0.973	System 90 is a high hardness, low viscosity, non-TDI based polyurethane with excellent mechanical properties. It contains no fillers or plasticizers, and is recommended for applications requiring high strength and good elongation.
95	Vorite 719-M1 Polycin 935	36 64	5000 800	1200	60A	600	100	110	40	1.174 0.957	System 95 is a low hardness, low viscosity, non-TDI based polyurethane having outstanding hydrolytic stability and chemical resistance. It is designed to give 3% to 5% expansion upon curing thereby insuring an air and water tight seal. It is recommended for use in potting load coils, load coil cases, cable stubs and cable splice encapsulation.
96M-1	Vorite 727-M2 Polycin 974-M1	44 56	1800 1000	900	63A	425	100	84	50	1.130 0.980	System 96M-1 is a low hardness, low viscosity, non-TDI based polyurethane system which exhibits excellent adhesion, chemical resistance, and hydrolytic stability. It is recommended for use in potting load coils, cable stubs, and terminal blocks.
97	Vorite 729 Polycin 989 M-1	40 60	550 700	600	55A	600	200	129	140	1.170 0.940	System 97 is a soft, very low viscosity, non-TDI based polyurethane. Its excellent low temperature properties and low mix viscosity make it ideal for potting stress sensitive components such as reed relays and ferro sensors.
106	Vorite 719-M1 Polycin 1598	36 64	5000 700	1100	60A	600	100	110	40	1.174 0.957	System 106 is a low hardness, low viscosity, non-TDI based polyurethane having outstanding hydrolytic stability. It passes the Naval Avionics Test (28 days @ 95% R.H./100°C) and is recommended for potting components requiring good outdoor weathering such as in terminal blocks and pedestals.
108M-1	Vorite 787 Polycin 1631-M1	32 68	2280 465	975	50A	180	70	31	80	1.130 0.980	System 108M-1 is a soft, low viscosity, non-TDI based polyurethane having outstanding low temperature properties. It is recommended for applications requiring low embedment stress and excellent temperature cycling properties (-60°F to 180°F).
Reenterable Encapsulant	Vorite 715-M1 Polycin 934-M3	17 83	130 315	300	30 "00"	35	130	4.9	30	1.019 0.894	Reenterable Encapsulant is a very low viscosity, non-TDI based polyurethane having a unique combination of low tear and tensile strength with relatively high elongation. This unique set of physical properties, together with its low viscosity make it an ideal reenterable cable splice encapsulant.

[Note: All viscosities, gel times, densities, and physical properties are at 25°C.

Note: Vorite/Polycin Systems will reach full cure at room temperature in about 7 to 10 days. However, curing can be accelerated by curing overnight at room temperature followed by an oven cure of 8 hours at 80°C. Preheating the components, Vorite to 50°C maximum and Polycin to 60°C maximum, will also accelerate curing; however, the gel time will be decreased.

POLYURETHANE

Biothane Systems for

BIOETHANE™ SYSTEMS FOR BIOMEDICAL APPLICATIONS

CasChem's Biothane polyurethane systems have served the biomedical field for over fifteen years in such critical areas as blood and human tissue contact. The Biothane systems consist of two liquid components, the Vorite prepolymer and the Polycin polyol, which when mixed together cure at room temperature to yield the crosslinked urethane.

Recognizing that different product designs require a specialized approach, CasChem has developed a broad line of Biothane Systems which exhibit a variety of processing and performance properties: Typical of these are: low viscosity systems for penetration and bubble release; high viscosity systems for controlled flow and penetration; thixotropic systems for non-penetration and non-flow; slow, medium and fast gelling systems; low, medium and high hardness systems; alcohol resistant systems.

Consistent with our desire to offer the ultimate in performance, the following properties have been designed into every Biothane System: resistant to ethylene oxide and steam sterilization; low shrinkage and low exotherm; low moisture sensitivity; excellent hydrolytic stability; heat stable; excellent wetting; good adhesion to a variety of substrates.

The table covering Biomedical applications lists some of our Biothane Systems which are being used as potting and encapsulating compounds, adhesives, coatings, and sealants for devices such as hollow fiber and folded membrane artificial kidneys, blood oxygenators, blood filters, catheters, and industrial filters.

SYSTEM #	COMPONENTS	MIX RATIO (PBW)
228	Vorite 689 Polycin 936	48 52
229	Vorite 689 Polycin 943	38 62
230	Vorite 689 Polycin 942	46 54
236	Vorite 689 Polycin 957	44 56
251	Vorite 689 Polycin 937	49 51
255	Vorite 1701 Polycin 1670	42 58
256	Vorite 1701 Polycin 1679	41 59

URETHANE CHEMICALS FOR COATINGS APPLICATIONS

POLYCIN POLYOLS

Polycins are hydroxyl terminated polyols and are used to formulate coating, adhesives and sealants.

Ask your CasChem representative or write for technical literature covering our Caspol™ polyols for high solids, high performance, two component polyurethane coatings.

Caspol polyols are used to formulate coatings with the following properties:

—high solids at low viscosities, outstanding water resistance, durability, superior color retention, high impact and abrasion resistance, high initial and retained gloss, ability to adhere to a variety of substrates, good resistance to alkalis and acids, lubricating oils, ozone, cold check and weathering. The coat-

ings are characterized by an unusual combination of high hardness and flexibility. Uses for Caspol polyol based urethanes include coatings for buses, trucks and railways cars, aircraft topcoats, marine and maintenance coatings (concrete and metal tanks, bridges, etc.), plastic parts and equipment housings as well as traditional uses such as wood and leather finishes.

VORITE PREPOLYMERS

Vorite NCO terminated prepolymers are used as the reactive component of two package urethane coatings and are curable with both polyols and amines. Several of the Vorites relatively low viscosities make them useful in high solids or 100% solids applications.

SYSTEMS AND CHEMICALS

Biomedical Applications

VISCOSITY (CPS) @ (25°C)		GEL TIME (25°C)		HARDNESS (SHORE)	DENSITY (g/cc)	PRODUCT INFORMATION
COMPONENTS	MIX	MASS (gm)	(MINUTES)			
11,000 800	3200	60	106	63/44D	1.16 .96	Biothane System 228 is a moderately high hardness, low viscosity, non-TDI based polyurethane. It has excellent wetting properties, good adhesion to many plastics, and good cutting properties. It is recommended for potting hollow fibers used in artificial kidneys.
11,000 450	90,000	60	30	75A/73A	1.16 1.00	Biothane System 229 is a thixotropic, non-TDI based polyurethane of moderately low hardness. Thixotropy develops almost instantly upon mixing. It is recommended for applications requiring non-penetrating and non-flow properties such as folded membrane artificial kidneys.
11,000 800	740(40°C)	300	50	50/35D 94/91A	1.16 0.96	Biothane System 230 is a relatively low viscosity, non-TDI based polyurethane specially designed to minimize bubble generation when applied to humectant and moisture containing membranes. It is recommended for use in folded membrane artificial kidneys.
11,000 10,500	11,800	300	27	61/44D	1.160 0.986	Biothane System 236 is a high viscosity, moderately high hardness, relatively fast gelling, non-TDI based polyurethane. Its high viscosity and fast gelation make it ideal for applications requiring controlled flow and penetration, such as folded membrane artificial kidneys.
11,000 800	2600	300	40	62/54D	1.16 0.96	Biothane System 251 is a low viscosity, high hardness, non-TDI based polyurethane. It has good adhesion, is resistant to alcohol and water; and is recommended for use in industrial filters.
8500 250	1500	60	9	80/63A	1.18 1.02	Biothane System 255 is a low viscosity, moderately hard, very fast gelling, non-TDI based polyurethane. It is recommended for use in hollow fiber artificial kidneys where fast production cycles are required; and for use in special fibers (such as polypropylene hollow fibers) where minimum penetration into the fiber is required.
8500 800	1600	50	25	85/70A	1.18 0.96	Biothane System 256 is a low viscosity, moderately hard, non-TDI based polyurethane. It has good alcohol and water resistance and can be dry-cut (no cutting lubricant is required). It is recommended for use in hollow fiber artificial kidneys.

Note: Biothane Systems will reach full cure at room temperature in about 7 to 10 days. However, curing can be accelerated by curing overnight at room temperature followed by an oven cure of 8 hours at 80°C. Preheating the components, Vorite to 50°C maximum and Polycin to 80°C maximum, will also accelerate curing, however, the gel time will be decreased.

URETHANE CHEMICALS FOR COATINGS APPLICATIONS, *continued*

ADHESIVES AND SEALANTS

Vorite prepolymers and Polycin polyols can be used to formulate polyurethane adhesive/sealants for bonding/sealing metals, wood, glass, various rubbers, plastic products and composites. The adhesive bond ages well under normal conditions of temperature and humidity and is not affected seriously by lubricating or fuel oils.

Vorite prepolymer and Polycin polyol based systems also find application as aggregate binders (sand, gravel, etc.) for patching and repair compounds.

Vorite 677M-3 (and its sprayable Vorite 677M-5 variant) is a specially designed one package reactive adhesive used for installing outdoor and indoor recreational surfaces such as artificial grass and indoor/outdoor carpet.

VINYL URETHANE COATING SYSTEM (EC-167)

Polycin 172 and Vorite 174 are the CasChem components in EC 167, a unique, self-priming system suitable for both priming and top coating plywood for **exterior use**. This coating can be used as a total finish (self-priming top coat) or primer for wood, hardboard and overlay. EC-167 (either freshly coated or weathered) has excellent intercoat adhesion when top coated with acrylic latex, vinyl acetate latex, alkyd, drying oil, silicone alkyd and solution vinyl top coats. EC-167 has been recommended as a thin film coating system qualified by The American Plywood Association for finishing Exterior sanded and Medium Density overlaid plywood. See separate bulletin on vinyl urethane coating system (EC 167).

URETHANE CHEMICALS FOR COATINGS APPLICATIONS

POLYOLS

- DB OIL** Triglyceride of ricinoleic acid. A triol of exceptional uniformity and low acidity.
- POLYCIN 51** Low viscosity, more flexibility, tensile strength and elongation than DB Oil while being slightly softer.
- POLYCIN 53** Slightly harder and less flexible than Polycin 51. Slightly higher viscosity than Polycin 51.
- POLYCIN 172** Used to produce vinyl-urethane coatings; reacts with urethane prepolymers (see Vorite 174) to enhance flexibility, toughness and durability of coating; see separate bulletin on vinyl urethane coating system (EC167).
- POLYCIN 936** Higher hardness, viscosity and less flexible than DB Oil with higher tensile strength than DB Oil.
- POLYCIN 52** Higher viscosity, hardness, tensile strength and lower flexibility than Polycin 53.
- POLYCIN 954** Higher hardness and tensile strength than Polycin 52.
- POLYCIN 12** Higher hardness, tensile strength and lower flexibility and viscosity than Polycin 954.
- POLYCIN 99F** Used for very high hardness, low flexibility and low elongation.

PREPOLYMERS

- VORITE 63** TDI based prepolymer with excellent flexibility, toughness and water resistance.
- VORITE 128** TDI based prepolymer with slightly better low temperature flexibility but less physical strength than Vorite 63.
- VORITE 689** Highly reactive MDI based prepolymer.
- VORITE 724** MDI based prepolymer with lower viscosity, reactivity, hardness and higher flexibility than Vorite 689.
- VORITE 717** MDI based prepolymer with lower reactivity and higher flexibility than Vorite 724. Bake curing recommended.
- VORITE 767** Aliphatic isocyanate based prepolymer for UV light stable coatings with high flexibility. Bake curing recommended.
- VORITE 1700** Aliphatic isocyanate based prepolymer for UV light stable coatings. Harder and less flexible than Vorite 767. Bake curing recommended.
- VORITE 1702** Aliphatic isocyanate based prepolymer for UV light stable coatings with room temperature curing.
- VORITE 174** Used for curing hydroxyl containing vinyl resins and Polycin 172 (see Polycin 172); see separate bulletin on vinyl urethane coating system (EC167).

	Viscosity (cps) @ 25°C	Acid Value	Hydroxyl Value	Sp. Gr. 25°C/25°C	Color (Gardner)	Pour Point °F	Percent NCO	Equivalent Weight	Functionality
DB Oil	720	0.6	164	0.959	1+	-10	—	342	3
Polycin 51	290	2.0	288	0.960	2	-15	—	195	2
Polycin 53	360	3.0	260	0.965	2	-5	—	216	2
Polycin 172 (75% N.V.)	90	0.4	170	0.998	2+	-30	—	330	2
Polycin 936	900	1.0	190	0.967	3+	—	—	295	3
Polycin 52	870	5.0	345	0.985	2+	+20	—	162	3
Polycin 954	1,100	3.5	205	0.980	7+	—	—	274	3
Polycin 12	3,500	3.0	327	0.999	9	—	—	170	4
Polycin 99F	1,200	0.5	285	1.02	1	+7	—	197	5
Vorite 63	17,300	—	—	1.113	3	+40	14.4	288	2
Vorite 128	21,500	—	—	1.077	2	+35	10.8	388	3
Vorite 689	12,000	—	—	1.170	2	+30	17.0	247	2
Vorite 724	3,400	—	—	1.190	5+	—	19.6	214	2
Vorite 717	4,800	—	—	1.146	3	—	19.2	219	2
Vorite 767	4,600	—	—	1.025	2	—	16.0	263	3
Vorite 1700	60,000	—	—	1.060	4	—	16.4	256	3
Vorite 1702	25,000	—	—	1.130	1+	—	20.4	206	3
Vorite 174 (75% N.V.)	1,800	—	—	1.007	4	-30	7.6	553	3
Vorite 677M-3 (75% N.V.)	1,000	—	—	0.988	—	—	—	—	—

TOXICITY AND HANDLING

Isocyanates are topically irritating to the skin, eyes and respiratory tract, and when inhaled, can cause damage to the mucous membranes. The MDI and aliphatic isocyanate based prepolymers are based on low vapor pressure isocyanates. However, handling precautions should be strictly enforced, when large amounts of prepolymer are used, including proper ventilation and the use of protective goggles, gloves and rubber aprons. If skin contact does occur, remove excess and rinse immediately with generous quantities of soap and water. Any spills should be covered with sawdust and treated with a dilute aqueous solution of ammonium hydroxide, or an alcohol (methyl or ethyl) and water before disposal.

This information is intended as a brief summary and is necessarily incomplete. Material Safety Data Sheets are available and will be supplied upon request.

COSMETICS-TOILETRIES-PERSONAL PRODUCTS

Castor oil is unique among all oils, fats and waxes, being the only source of hydroxyl bearing fatty acid in triglyceride form. The refined oil and derivatives are fundamental ingredients which formulators have used for many years. Castor oil was used by the Egyptians who prepared lip coloring, hair oils and skin treatments. The combination of properties,—unique to castor products,—are defined as

- emolliency—mildness
- lubricity—softening
- surface wetting
- dispersive power
- broad solubility and compatibility
- gellation and swelling
- plasticization

Castor oil is noted for its ability to carry the highest possible concentration of dyes and pigments needed in lipsticks and cosmetics in general. It is recognized for the ability to form stable emulsions—a function largely related to the hydroxylated fatty structure.

An important ancillary factor is the availability of castor's properties in a wide variety of derivatives. Chemical conversion provides products ranging from low viscosity to high melting point solids, from unsaturation to full saturation, from oil soluble to complete water solubility. The derivatives are found to have broad compatibility with natural and synthetic waxes, solvents, glycerine, glycols and esters;—all important ingredients to the professional formulator. The water soluble soaps and those made with P-10 acids provide important synergism in raising the phenol coefficient of disinfectants. This refers to those based on phenols, cresylic acids and pine oil.

The basic hydroxylated structure of castor oil enables the production of transparent bar soaps and high solids liquid soaps.

Following is a summary of CasChem products grouped according to structure:

Refined Castor Oils

- AA USP
- Crystal O
- Crystal Crown

Waxes

- Castorwax N.F.
- Castorwax MP70
- Castorwax MP80

Fatty Acids

- P-10 Acid (liquid)
- 12 Hydroxystearic (wax)

Surfactants

(Nonionic)

- Surfactol 318 (liquid)
- Surfactol 365 (liquid)—
Water soluble
- Surfactol 590 (solid)—
Water soluble

Surfactol 13 (liquid)—

Germicidal, Bactericidal and Fungicidal Products

- Solricin 135 {
- Solricin 535 { —phenol coefficient synergists
- Undecylenic Acid {
- Zinc undecylenate { —athlete's foot treatment
and skin products
- Ivex-10

Product descriptions and chemical constants are found in other sections of this bulletin.

Emollients and Emulsifiers

CasChem has recently introduced a new line of castor based derivatives specifically designed to meet the needs of the cosmetics, toiletries and household products industries. Our new **Naturechem** emollients and emulsifiers are safe, practically non-irritating and odorless. In addition, they offer a wide range of functional advantages useful in the preparation of emulsions and anhydrous systems, such as:

- Improved Stability
- Spreadability
- Dispersing Action
- Broad Solubility
- Thickening Properties
- Improved "Pay-Off" in Stick Products

Product bulletins containing chemical constants, toxicity information and starting formulations for **Naturechem** products are available upon request.

The applications of these castor derivatives and our **Naturechem** products are described in general form, by the following listing.

lipstick	facial masks
lip gloss	vanishing cream
eye shadow	hand lotion
eye makeup remover stick	suntan lotions
eyebrow pencil	moisturizers
emollient creams	pomade
skin cleanser	hair grooming cream
rouge	transparent bar soap
germicidal powders,	liquid soap
lotions, sprays	hand cleaner
wax compounds	anti-perspirant sticks
unguents	

Specific formulating suggestions are offered on inquiry.

See Separate Section for F.D.A. Sanction List

SURFACTANTS

CasChem produces soaps (anionic surfactants) which are listed on page 19. Surfactol 13 is a modified long chain ester found particularly useful in pigment/dye wetting for aqueous dispersions. It provides dual solubility in water and solvent systems. Other Surfactols involve the addition of ethylene and propylene oxide to the hydroxyl and carboxyl groups thus affecting the tolerance for water. The treatment, depending on the number of fatty chains and degree of unsaturation, produces non-ionic surfactants with HLB values that give varying ranges of dispersibility and water solubility.

These non-ionic surfactants are biodegradable. They are ex-

cellent emulsifiers for a wide variety of materials including oils, fats, waxes, oleoresinous vehicles and alkyds for coating and inks, insecticides, herbicides, polyesters and acrylics. They are solubilizers and dispersants for dyes, colorants, perfumes, essential oils and extracts. The need for surface wetting, emulsifiability and lubricity finds them widely used in formulating textile processing chemicals.

In general these products provide a means of utilizing the basic properties of castor oil (lubricity, penetration, pigment wetting and broad compatibility) in water-based systems.

PRODUCT	ACID VALUE	IODINE VALUE (WIJS)	HYDROXYL VALUE	SAPON. VALUE	SPECIFIC GRAVITY 25°C/25°C	COLOR (Gardner)	VISCOSITY Stokes @ 25°C	POUR POINT °F	PRODUCT INFORMATION
Surfactol 13	—	70	425	130	1.005	4	17	—	The Surfactols range from self-emulsifiable (318) to fully soluble in water (365 and 380). They are emulsifiers in topical creams and lotions, latex paints, inks, pesticides and floor polishes. Also used in soluble cutting oils, mold release agents, universal colorant vehicles in both aqueous and non-aqueous systems (for paints and inks), textile auxiliaries, oil field drilling fluids, non-flammable hydraulic and functional fluids, metal cleaners and cosmetics.
Surfactol 318	0.2	70	141	148	0.984	3	7.0	—25	
Surfactol 340	0.3	51	112	108	1.015	4	5.0	—30	
Surfactol 365	0.2	36	80	68	1.054	3	4.7	50	
Surfactol 380	0.2	23	50	36	1.076	3	paste	paste	
Surfactol 590	1.2	50	24	18	1.180	3	paste	paste	

DISPERSANTS FOR PIGMENTS AND DYES

LIQUIDS

A primary characteristic of castor oil and its derivatives is their superior effectiveness in surface wetting when dispersing pigments and dyes. The surface wetting property is attributed to the long carbon chain containing the hydroxyl group.

Refined castor oil has an established position in cosmetics as a highly efficient dispersant for pigments and dyes in lipstick and related products. Similarly, castor oil and the polymerized castor oils are used in nitrocellulose lacquers and inks as non-volatile "grinding vehicles" and plasticizers. These performance characteristics—dispersant and plasticizer—are primary properties of the Flexricin/Paricin esters, and should be considered when selecting a dispersant for dyes and pigments.

The polymerized oils are particularly well suited because of their viscosity, providing "tack" needed for the high shear roller mill processing. The fundamental castor properties of polarity and wetting are equally important in the pigment flushing process. Certain esters and ethoxylated castor oils are ideally suited for use in the universal color systems for paints and inks.

Polycin 70F is an example, representing the effectiveness of castor based pigment dispersants. Its use has been established as an ink vehicle for pigment dispersion, which is described on page 22.

SOLIDS

The same properties apply to the preparation of highly concentrated pelletized chip colorants for plastics, fibers, inks and lacquers. Many pigments and colors are concentrated from 50% to 65% with resin. Paricin 220 or Paricin 285 are high melting amide waxes that provide excellent pigment wetting properties. They are insoluble in water and compatible with polystyrene, polyethylene, polypropylene, nylon, ABS, rigid vinyls and cellulosics. Their polarity prevents aggregate formation during dispersion in the high intensity mixing equipment. Superiority of the Paricin is seen in color development and homogeneity of the final extruded, molded or calendered plastics. Surface defects, such as streaking and migration are eliminated.

The addition of Paricin 220 and 285 as dispersants also facilitates the incorporation of other additives such as flame retardants, stabilizers, UV absorbers and anti-oxidants. Chemical constants are detailed on page 11 of this bulletin.

CASTOR SOAPS

RICINOLEATES AND UNDECYLENATES

The ricinoleates, being soaps of 12-hydroxyoleic acid, differ from other fatty acid soaps by reason of the hydroxyl group. This signifies exceptional lubricating properties, emolliency and solubility in alcohols, ether-alcohols and glycols. The hydroxyl will affect solubility in other organic solvents, as well as gelling behavior. Thickening and mold release are typical characteristics. The ricinoleates are used in cosmetic and toilet goods, specialty greases and lubricants, vinyl compounds, rubber and polymers.

The water soluble ricinoleates are characterized as emulsifiers and dispersants, which produce clear aqueous solutions with low viscosities at higher concentrations than with other soaps. The solubilizing property provides synergism of the phenol coefficient of germicides and disinfectants. Incorporated in natural and synthetic rubber foams they stabilize the cell size and wall strength, and provide mold release which facilitate cutting of sharply defined sizes and shapes.

The water insoluble soaps, both ricinoleates and undecylenates, demonstrate varying solubility and gelling action. The ric-

inoleates are used as catalysts and for vinyl stabilization; the undecylenates for fungicidal treatment of the skin.

Calcium ricinoleate is a stabilizer for vinyls particularly in transparent food packaging. It is a thickener for plastisols. As a water repellent and emollient it is used in face powders, eye liners and shadow. Lithium ricinoleate is a fast acting alcoholysis catalyst for alkyd and polyester resins. In contrast with other catalysts it does not form insoluble phthalates thus eliminating time consuming filtration. Zinc ricinoleate is recognized as a true deodorizing agent, not a masking agent, important in cosmetics, toiletries and personal products.

The undecylenates exhibit strong fungicidal and germicidal properties, useful in pharmaceutical and cosmetic preparations. Their efficacy is enhanced by mildness to the skin and absence of side-effects. Zinc undecylenate, meeting National Formulary standards, is widely used in powders, ointments and lotions for treatment of athlete's foot and other skin disorders. Ivex 10 is an optimized combination of zinc undecylenate and undecylenic acid for use in anti-fungal foot powders.

WATER SOLUBLE

	FORM	SOLIDS %	VISCOSITY Stokes @ 25°C	SP. GR. @ 25°C	COLOR (Gardner)	PRODUCT INFORMATION
Solricin 235 (Potassium castor soap solution in water)	liquid	35	0.9	1.034	4	Mild germicide, synergizes phenol coefficient of disinfectants. Glycerized rubber lubricant. Emulsifier and foam stabilizer in foamed rubber.
Solricin 285 (Ammonium Ricinoleate solution in water)	paste	84	—	0.967	amber	Rust-proofing agent (leaves corrosion resistant film on exposure to air); useful in both oil and water systems (e.g. cutting oils). Lubricant for materials granulated in water.
Solricin 435 (Sodium Ricinoleate solution in water)	liquid	35	2.0	1.022	4	Emulsifier, stabilizer and defoamer for emulsion polymerization of resins such as polyvinyl chloride and polyvinyl acetate. Glycerine free.
Solricin 535 (Sodium Ricinoleate solution in water)	liquid	35	1.0	1.025	4	Mild germicide, synergizes phenol coefficient of disinfectants. Glycerized rubber lubricant. Emulsifier and foam stabilizer in foamed rubber.

WATER INSOLUBLE

	FORM	SOLIDS %	BULK DENSITY lb/gal	COLOR	MELTING POINT °C	PRODUCT INFORMATION
Calcium Ricinoleate	100 Mesh Powder	97.5	3.16	white	85	Non-toxic stabilizer-lubricant for vinyls (FDA approved); particularly useful in transparent meat packaging film; thickening agent for plastisols; very good solubility in alcohols, glycols and ether-alcohols.
Lithium Ricinoleate 50%	Paste	50	8.34	white	—	Alcoholysis catalyst for alkyds and polyesters. Fast acting; does not form insoluble colloidal metallic phthalates; eliminates time-consuming filtration; yields products free of catalyst haze.
Zinc Undecylenate N.F.	100 Mesh Powder	99.7	1.25	white	115	Is widely used in the formulating of powders and ointments for the treatment of athlete's foot and other skin irritations and meets National Formulary Specifications.
Ivex 10	100 Mesh Powder	99.9	9.66	white	—	For anti fungal foot powders.
Magnesium Ricinoleate	Tacky Solid	95	—	white	—	Corrosion inhibitor.

PROCESSING AIDS FOR RUBBER AND PLASTICS

Processing aids are liquids and solids added to polymeric compounds to improve handling properties during mixing, molding, extruding, and calendering. They eliminate problems encountered by the finished product in storage (blocking) or use (static electricity) and usually improve general appearance. They improve processing by wetting and dispersing action, and in the case of rubber, by "nerve-breaking."

Refined castor oil, AA Standard, has a long record of use in rubber compounding as general purpose plasticizer, wetting agent and lubricant. Among many advantages it has no deleterious effect on cured rubber.

#30 OIL IN RUBBER

#30 Oil is a viscous liquid plasticizer and processing aid for rubber. It ranks as the finest non-volatile, non-extrudable additive available to rubber compounders. #30 oil has an extremely low vapor pressure and is highly compatible with rubber, neoprene and most other synthetic elastomers.

LUBRICIN 25 IN PLASTICS

Lubricin 25 improves the processing of rigid PVC during calendering, injection molding of pipe, fittings, conduit, sheet and profiles.

Compounding rigid PVC involves developing a final product with the maximum physical properties attainable. This calls for high production rates and maximum uniformity in contour, finish and color. The composition must possess the ability to be reworked. To achieve such a combination of properties, the vinyl compound must be processed near the thermal limits of the resin, which makes the lubricant-stabilizer performance critical. In addition, this lubricant-stabilizer combination should not lower the heat distortion point and should provide sufficient reserve stability to allow reworking.

Lubricin 25 at 0.3 parts PHR performs all of the above, and provides better gloss or finish to the end product. Unlike metal soap type lubricants, Lubricin 25 does not adversely affect fusion or cause plate-out, which hinders throughput and contour.

LUBRICIN 25 IN RUBBER

Lubricin 25 is uniquely compatible with synthetic and natural rubbers.

Unlike most paraffinic and natural waxes which are used at low levels for lubrication and surface bloom, Lubricin 25 may be employed at high levels (Example: 20 PHR) with no tendency to migrate to the surface of the rubber. Lubricin 25 acts as an efficient processing aid with little or no effect on tensile strength and hardness. It improves the appearance of molded goods and provides excellent shape retention on extrusion.

Mold release and anti-blocking are provided at levels as low as 1½ PHR.

PARICIN 8 IN VINYL PLASTICS

Paricin 8 is an ester with outstanding heat stability and excellent dielectric properties. Paricin 8 is compatible with vinyl copolymers, cellulosic resins and synthetic rubbers. As a secondary plasticizer it is noted for its retention of elongation upon heat aging, low volatility and plasticizing efficiency. Paricin 8 may replace up to 50% of the primary plasticizer. At

0.5 to 5.0 PHR, it is a highly effective lubricant and processing aid. A typical application for Paricin 8 is in wire jacketing compounds. It provides the following benefits when used in vinyl resins:

- Highly effective dispersion of pigments and fillers for improved product appearance.
- Retained low viscosity in plastisols.
- Improved low temperature flexibility.
- Co-stabilization with certain tin stabilizers.
- Resistance to oxidation and weathering.
- Outstanding electrical properties.

Chemical constants for Paricin 8 are on page 8.

FLEXRICIN P-4 AND P-6 IN RUBBER

Flexricin P-4 and P-6 as plasticizer-processing aids provide a wide spectrum of use lacking in most ester-type plasticizers. They exhibit high compatibility with SBR (styrene-butadiene), NBR (acrylonitrile-butadiene), neoprene and most other elastomers. They are specifically recommended as low-temperature plasticizers where their performance is superior to phthalic and fatty ester plasticizers. Both are also general purpose ester plasticizers, with excellent softening action to produce low durometer stocks, good permanence and resistance to extraction.

Both plasticizers have been particularly successful in gaskets for bolted steel gasoline tanks; hose assemblies, sheet, strips and molded shapes for oil resistance and -20°F service; general purpose oil resistant rubber; aircraft rubber requiring fuel and oil resistance.

Flexricin P-4 and Flexricin P-6 are ideal plasticizers for such applications as: low-temperature neoprene molded parts where electrical properties are critical, neoprene refrigerator gaskets and NBR (nitrile) solvent-resistant gaskets where flexibility at -65°F is imperative, NBR (nitrile) diaphragms, pump pistons and seals used in the petroleum industry, and industrial hose where resistance to water, solvents and chemicals is required. Chemical constants for Flexricin P-4 and P-6 are on page 8.

CALCIUM RICINOLEATE IN VINYL PLASTICS

Calcium ricinoleate is a non-toxic F.D.A. approved powdered stabilizer for vinyl resins. It is generally used at a level of 3 parts PHR, preferably in combination with an epoxy oil stabilizer. In addition to the stabilizer effectiveness its lubricity and water repellent properties are of primary importance.

PARICIN 285 AND PARICIN 220 IN PLASTICS

Paricin 285 and 220 are amide derivatives of hydroxystearic acid. They are hard and tough with outstanding water and oil resistance and high melting points. Added at levels from 0.5 to 2% in thermoplastic resins and rubber they function as anti-block, anti-static, slip, internal lubricant and mold release agents. They perform one or all of these functions in polyolefins, PVC, cellulose acetate butyrate, butyl rubber, polyvinylidene chloride, polyvinyl butyral, acrylonitrile and butadiene styrene polymers. In thermosetting plastics, Paricin 285 added at 0.5 to 1.0% acts as a molding lubricant, which will not spot the finished plastic or exude at room temperature.

Specifically, at a level of 0.1 parts per hundred of

Processing Aids for Rubber and Plastics, *continued*

polypropylene, Paricin 285 reduces friction and static build-up to permit easier processing and production of sheeted goods. In polystyrene, at .125%, it improves the processing characteristics of the high impact type. It also improves the overall appearance and color development of such extruded and molded parts. At a level of 2%, Paricin 285 acts as an internal lubricant for rigid vinyls during extrusion. Chemical constants can be found on page 11.

PARICIN 1 IN RUBBER

Paricin 1 is an effective internal lubricant and mold release agent, for butyl, neoprene, buna N (nitrile) and other synthetic elastomers for the reduction of surface tack. Acute mold release

problems and surface tack, often encountered in such elastomers as butyl rubber, can be eliminated by adding 2-5% of Paricin 1. The effective migration of Paricin 1 to the surface of butyl rubber, provides surface lubricity and permits applications where the natural friction properties of butyl-rubber are objectionable. The internal lubricity imparted by Paricin 1 also reduces hysteresis and scorching tendencies. Paricin 1 added at a level of 4% to press-cured, ethylene-propylene rubber completely eliminates surface tack.

12-HYDROXYSTEARIC ACID IN RUBBER

Functions as an activator and internal lubricant for natural and synthetic rubbers.

LUBRICANT SPECIALTIES

The hydroxyl groups in castor oil and its derivatives distinguish it from all other fats and oils. The ability to carry relatively high loads without rupture of the lubricant film, coupled with the low coefficient of friction under conditions of boundary lubrication, give castor a unique place in this field.

The inherent lubricity is utilized with AA Standard in direct use such as gas compressors, vacuum pumps, rubber molding, and the continuous casting of steel and aluminum. Similarly, the Refined Castor Oils are used in metal stamping, wire drawing compounds, plug valve greases and in alcohol base two-cycle engine fuels.

AA-USP Castor Oil is a standard lubricant for food processing plants. It complies with several FDA regulations in a variety of uses: hard candy release and anti-sticking agent, protective coatings for vitamins, tableting, and lubricants with incidental food contact.

Both AA-USP and XXX-1 are authorized by the U.S. Department of Agriculture for trolley lubrication in meat packing plants. Such applications extend to conveyor and equipment lubricants for bakeries, canneries and food/beverage operations. The approval of AA-USP and XXX-1 for lubricants with incidental food contact is meaningful for XXX-1 which can be used to economic advantage as an additive to for less expensive mineral oil.

Increased oiliness and lubricity for petroleum base fluids is particularly effective with Lubricin N-1 and Paricin 6. These are additives for use in motor fuels, upper cylinder oils, penetrating oils and all types of systems for cutting, machining and general metal working. In addition to lubricity, they reduce rust, corrosion and metal wear with detergent action on tar, varnish and carbon deposits. Paricin 6 offers performance advantages because of its complete saturation and reduced susceptibility to oxidation.

Paricin 8 offers dual performance as a high temperature lubricant and a broadly compatible plasticizer with low volatility and very good electrical properties. The lubricant/plasticizer function is of great value in plastic production including wire jacketing. Flexricin 100 has the viscosity and lubricity of the castor hydroxyl bearing esters such as Lubricin N-1 and Paricin 6. Its acidic nature suggests uses in water borne systems, such as with P-10 Acid.

CasChem's Castor Oils and derivatives are used direct, or as lubricity additives, in both oil base and water dispersed systems.

Thus they are applicable to hydraulic fluids, soluble oils and coolants. Standard emulsifiers for water bases include Surfactol 365 and Surfactol 590. The latter is particularly well suited to water soluble solid systems (as in bar-type lubricants for conveyor chains). Chemical constants for Surfactols can be found on page 18. Water based lubricants also utilize the Solricin castor soaps. Chemical constants for Solricin soaps can be found on page 19. The requirement to produce in-situ soaps is met by reacting with Flexricin 100 or P-10 Acid of which there are many examples in technical and patent literature, with a long record of industrial usage. P-10 Acid is a starting point for ethoxylated products for all types of water dispersed emulsifiers, dispersants and lubricants. In this concept of product application, the performance in textile processing chemicals is a typical example of diversity beyond the elementary friction-proofing of two metal surfaces in the more conventional type of lubrication.

In highly specialized formulations the lubricity and stability of Castorwax are important. It is used in solid lubricants and, in the powder form, for compressed metal powders and tableting. Dispersion 33 provides a base for water borne systems. 12-Hydroxystearic acid is used as a counterpart for P-10 Acid in emulsions requiring no chain unsaturation.

The Amide Waxes, particularly Paricin 285, are well suited to high temperature solid lubricants, including plug valve greases. In formulating such products a good balance of total performance properties is achieved by use of those liquid esters which have unusual resistance to aliphatic hydrocarbon; Flexricin 15B, Flexricin 13 and Flexricin 17.

PRODUCT	VISCOSITY STOKES @25°C	IODINE VALUE (WIJIS)	SAPON. VALUE	ACID VALUE
Lubricin N-1	.3	85	178	.7
Paricin 6	.3	2	276	4
Flexricin 100	4	90	186	120
XXX-1	3	120	185	3
P-10 Acid	4	89	186	180
Paricin 8	4-7	2	298	1
Lubricin 25	powder	3	180	2

SPECIALTY PRODUCTS

POLISH BASE (Emulsion or Solvent)

Emulsion A oil is an important component of emulsion type automobile and furniture polishes and cleaners that impart a durable high lustre protective film. Emulsion A oil contains no volatiles and enriches the surface of wood, metal and paint. Water based polishes are prepared by emulsifying the oil with alkalies and amines or non-ionic emulsifiers. Emulsion A oil is completely compatible with aliphatic solvents for preparation of solvent type polishes.

	Acid Value	Sapon Value	Sp. Gr. 25°C/25°C	Color (Gardner)	Viscosity Stokes @ 25°C
Emulsion A Oil	15	210	0.999	4	32

WAX DISPERSION

Dispersion 33 is an aqueous suspension of an extremely solvent resistant, high melting point Castorwax modification. It is an effective lubricant and mold release agent. As an impregnant for paper, cloth, wood, ceramics and other porous surfaces it imparts resistance to water and solvents. It is an excellent anti-blocking agent for resin emulsions and latices especially polyvinyl acetate copolymers.

	Viscosity Stokes @ 25°C	Sp. Gr. 25°C/25°C	Form
Dispersion 33	0.5	1.014	Milky Liquid

INK VEHICLE FOR PIGMENT DISPERSION-POLYICIN 70F

A high molecular weight castor ester, "Polycin 70F", permits the simple production of relatively inexpensive transparent dispersions for flexographic and gravure inks for foil, paper and film. Polycin 70F has excellent pigment wetting characteristics, body and tack, which produces a good mill base. Polycin 70F provides complete compatibility with nitrocellulose to at least 1 part binder to 1.3 parts of plasticizer. Pigmented mill bases, prepared on the three-roll mill with Polycin 70F can be reduced with solvents to formulate gravure inks which are equal to or better in gloss and transparency than those prepared from chip dispersions. These inks do not spew plasticizer, nor do they block in standard blocking tests. Adhesion to the substrate is excellent and caustic-solubility (for bottle labels) is unaffected. If three-roll milling is a difficult operation for a solvent-based ink plant, the ink formulator can work with flushed colors, based on

Polycin 70F. The flushed color can be reduced under a high-speed disc-mixer with vehicle and solvent, to yield flexographic and gravure inks with greater transparency and higher tinctorial value than those prepared from either two or three-roll mill dispersions. Polycin 70F is compatible with nitrocellulose, chlorinated rubber, polyamide resins, alcohol-soluble maleic, shellac (limited) and cellulose acetate butyrate. It is soluble in alcohols, esters, ketones, ethers and aromatic hydrocarbons, but has limited solubility in aliphatic hydrocarbons.

	Viscosity stokes @ 25°C	Color (Gardner)	Sp. Gr. @ 25°C/25°C	Acid Value
Polycin 70F	30	3+	.991	17

HYDROXYL OILS

These are castor ester modifications having increased hydroxyl content. For comparison, the hydroxyl value of refined castor oil is 164.

	Hydroxyl Value	Viscosity Stokes @ 25°C	Sp.Gr. 25°C/25°C	Sapon. Value	Color (Gardner)
Flexricin 17 (pentaerythritol ricinoleate) 3 primary hydroxyls and one secondary	328	31.0	0.999	157	8
Surfactol 13 (proprietary ester) Wetting agent, emulsifier, universal colorant vehicle	425	17	1.005	130	4

FDA SANCTION LIST

CasChem products are widely used as components of articles that contact food (indirect food additives) such as adhesives, paper and paperboard packaging, polymeric coatings and lubricants. The Code of Federal Regulations (CFR) is a Codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the U.S. Government. Title 21 CFR comprises the rules and regulations for the Food and Drug Administration (FDA), Department of Health, Education and Welfare.

The following lists the CasChem products, sanctioned by the FDA under Title 21 CFR, having specific indirect food additive applications.

21CFR PART 73.1—DILUENTS IN COLOR ADDITIVE MIXTURES FOR FOOD USE EXEMPT FROM CERTIFICATION.

AA USP castor oil
Crystal "O"

21CFR 172.876—CASTOR OIL

AA USP castor oil
Crystal "O"

21CFR PART 175—INDIRECT FOOD ADDITIVES—ADHESIVE COATINGS & COMPONENTS

175.105—Components of Adhesives

AA Standard castor oil	Pale 4
Calcium Ricinoleate	Pale 16
Castorwax hydrogenated castor oils	Pale 170
Castung dehydrated castor oils	Pale 1000
Flexricin P-1	Paricin 9
Flexricin P-3	Solricin 135
Flexricin P-4	Solricin 435
Flexricin 9	Solricin 535
Flexricin 13	Surfactol 13
Flexricin 15	Surfactol 318
12-Hydroxystearic Acid	Surfactol 365
Lubricin N-1	#15 Oil
P-10 Acid	#30 Oil
	#40 Oil

175.300—Components of Resinous and Polymeric Coatings

AA Standard castor oil	Solricin 135
Calcium Ricinoleate	Solricin 435
Castorwax hydrogenated castor oils	Solricin 535
Castung dehydrated castor oils	Surfactol 13
Flexricin 9	Surfactol 318
Flexricin 13	Surfactol 365
Flexricin 15	9-11 Acid
Lithium Ricinoleate	135 Acids
P-10 Acid	#15 Oil
Pale 4	#30 Oil
Pale 16	#40 Oil
Pale 170	
Pale 1000	

175.320—Resinous and Polymeric Coatings for Polyolefin Films

Calcium Ricinoleate	P-10 Acid
Castung dehydrated castor oils	Solricin 135
Flexricin 9	Solricin 435
Flexricin 13	Solricin 535
Flexricin 15	

21CFR PART 176—INDIRECT FOOD ADDITIVES: PAPER AND PAPERBOARD COMPONENTS

176.170—Components of Paper and Paperboard in Contact with Aqueous and Fatty Foods

AA Standard castor oil	Solricin 135
Calcium Ricinoleate	Solricin 435
Castorwax hydrogenated castor oils	Solricin 535
Castung dehydrated castor oils	Surfactol 13
Flexricin 9	Surfactol 318
Flexricin 13	Surfactol 365
Flexricin 15	9-11 Acid
Lithium Ricinoleate	135 Acids
P-10 Acid	#15 Oil
Pale 4	#30 Oil
Pale 16	#40 Oil
Pale 170	
Pale 1000	

176.180—Components of Paper and Paperboard in Contact with Dry Food

AA Standard castor oil	Solricin 135
Calcium Ricinoleate	Solricin 435
Castorwax hydrogenated castor oils	Solricin 535
Castung dehydrated castor oils	Surfactol 13
Flexricin 9	Surfactol 318
Flexricin 13	Surfactol 365
Flexricin 15	9-11 Acid
Lithium Ricinoleate	135 Acids
P-10 Acid	#15 Oil
Pale 4	#30 Oil
Pale 16	#40 Oil
Pale 170	
Pale 1000	

176.200—Defoaming Agents used in Coatings

AA Standard castor oil	P-10 Acid
Calcium Ricinoleate	Solricin 135
Flexricin P-1	Solricin 435
Lubricin N-1	Solricin 535

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176.210—Defoaming Agents used in the Manufacture of Paper and Paperboard

AA Standard castor oil	Pale 4
Calcium Ricinoleate	Pale 16
Castorwax hydrogenated castor oils	Pale 170
Flexricin P-1	Pale 1000
Flexricin P-3	Paricin 9
Flexricin 9	Solricin 135
Flexricin 13	Solricin 435
Flexricin 15	Solricin 535
12-Hydroxystearic Acid	Surfactol 13
Lubricin N-1	Surfactol 318
P-10 Acid	#15 Oil
	#30 Oil
	#40 Oil

21CFR PART 177—INDIRECT FOOD ADDITIVES—POLYMERS

177.1200—Cellophane

AA Standard castor oil	Lubricin N-1
Calcium Ricinoleate	P-10 Acid
Castorwax hydrogenated castor oils	Solricin 135
Castung dehydrated castor oils	Solricin 435
Flexricin P-1	Solricin 535

177.1210—Closures with Sealing Gaskets for Food Containers

AA Standard castor oil	Solricin 135
Calcium Ricinoleate	Solricin 435
Castorwax hydrogenated castor oils	Solricin 535
Flexricin 9	Surfactol 13
Flexricin 13	9-11 Acid
Flexricin 15	135 Acids
Lithium Ricinoleate	#15 Oil
P-10 Acid	#30 Oil
Pale 4	#40 Oil
Pale 16	
Pale 170	
Pale 1000	

177.2470—Polyoxymethylene Copolymer

Calcium Ricinoleate

177.2600—Rubber articles for Repeated Use

AA Standard castor oil	P-10 Acid
Calcium Ricinoleate	Solricin 135
Castung dehydrated castor oils	Solricin 435
Flexricin P-6	Solricin 535
12-Hydroxystearic Acid	

177.2800—Textiles and Textile Fibers

AA Standard castor oil	Pale 4
Calcium Ricinoleate	Pale 16
Castorwax hydrogenated castor oils	Pale 170
Castung dehydrated castor oils	Pale 1000
Flexricin P-1	Paricin 9
Flexricin P-3	Solricin 135
Flexricin P-6	Solricin 435
Flexricin 9	Solricin 535
Flexricin 13	Surfactol 13
12-Hydroxystearic Acid	#15 Oil
Lubricin N-1	#30 Oil
P-10 Acid	#40 Oil

21CFR PART 178—INDIRECT FOOD ADDITIVES: ADJUVANTS, PRODUCTION AIDS AND SANITIZERS

178.3130—Antistatic and/or Antifogging Agents in Food-packaging Materials

Flexricin 13

178.3280—Castor oil, Hydrogenated

Castorwax
Castorwax MP-70
Castorwax MP-80

178.3570—Lubricants with Incidental Food Contact

AA USP castor oil	Crystal "O"
Calcium Ricinoleate	12-Hydroxystearic Acid
Castung dehydrated castor oils	P-10 Acid
Crystal Crown	XXX-1

178.3910—Surface Lubricants used in the Manufacture of Metallic Articles

AA Standard castor oil	Solricin 135
Flexricin P-1	Solricin 435
Lubricin N-1	Solricin 535
P-10 Acid	

178.3860—Release Agents

Paricin 210
Paricin 220
Paricin 285

21CFR PART 181—PRIOR-SANCTIONED FOOD INGREDIENTS

181.26—Drying Oils as Components of Finished Resins

Castung 103 GH
Castung 403 Z-3

181.29—Stablizers

Calcium Ricinoleate

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CUSTOM PROCESSING AND MANUFACTURING OF SPECIALTY CHEMICALS

The Bayonne plant of CasChem, Inc. is located in northern New Jersey, where custom chemicals have been processed since 1922.

Specialty Chemicals manufacturing is the principal business of CasChem, Inc. The company has an ability to provide a wide variety of custom chemical processing services. Our well equipped production, laboratory and development facilities are at your service to make superior quality products at competitive costs in the fields of:

Esters	Urethanes
Fatty Acids	Polyols
Amides	Soaps
Quaternaries	Emulsions
Hydrogenated Products	

As a leader in manufacturing of castor oil derivatives, CASCHEM is well experienced in esterification, fat splitting, hydrogenation,

amidation, dehydration, saponification, distillation, homogenization, rapid cooling, polymerization, acetylation, etc.

A wide range of reactors are available for reactions at up to 600°F and 300 psig as well as scraped surface heat exchangers and homogenizers for special reactions, especially suitable for urethane reactions.

A highly skilled staff of professionals insures that products and services offered by CasChem, Inc. are of the highest quality. Experienced, cost conscious management is ready to help with your production problems. Client projects are covered by confidentiality agreements.

Bayonne, N.J. can load by rail, truck and barge.

For additional information,
please call CASCHEM.
201-858-7900

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